MARINE REVIEW.

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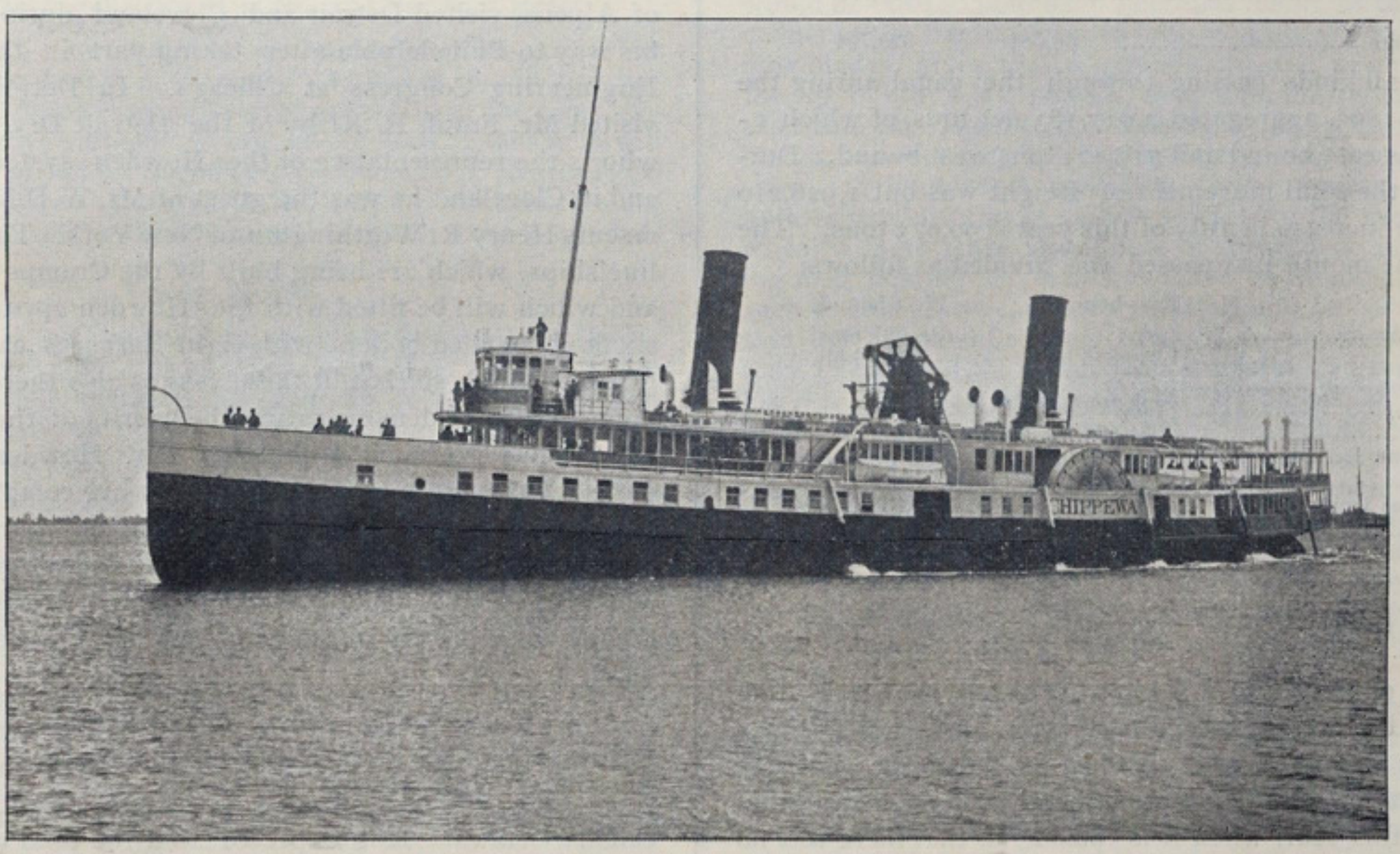
Lower Niagara Passenger Steamers.

The steel side wheel steamer Chippewa, pictured in this issue of the REVIEW, is the best production of a Canadian ship yard to be found in the lake region. She was built by the Hamilton Bridge Company of Hamilton, Ont., for the Niagara Navigation Company, and a few days ago joined the two other boats of that company the Chicora and Cibola, on the Toronto, Niagara, Ont., and Lewiston route. The new steamer has a very large amount of deck room and is permitted to carry 2,000 passengers. She is 300 feet in length between perpendiculars. Her engines, built by the W. & A. Fletcher Co., Hoboken, N. J., having a 75-inch cylinder and 11-foot stroke, is said to develop 3,100 horse-power. Steam is supplied by five boilers, each 10 feet 4 inches in diameter and 21 feet long. The officers in charge are, Capt., John McGiffin; James Richardson, first mate; William Walsh, engineer; N. F. Harbottle, purser and Fred Mossop, steward. Each of the three steamers of this line now makes two round trips a day, except Sundays—six in all. They connect with the New York Central trains at Lewiston and the Michigan Central at Niagara. We are indebted to the Buffalo Illustrated Express for the engraving.



PASSENGER STEAMER CHIPPEWA—BUILT BY THE HAMILTON BRIDGE CO., HAMILTON, ONT.

Temperature of Lake Superior Water.

Mr. Harvey H. Brown of Cleveland was fortunate enough to be enabled to spare time from business for three trips to Lake Superior last month on the steel steamer Castalia, one of a dozen or more big boats controlled in the office of Harvey H. Brown & Co. It is well known that on account of the low temperature of the water of Lake Superior, steam vessels running on that lake can improve upon the speed made on the lower lakes, on account of the advantage in the cold water for condensing steam. A discussion of this subject caused Mr. Brown to secure a reliable thermometer and take the temperature of the water in different parts of the lakes. From one of the steamer's small pumps he secured water at a depth of about 13 feet below the surface at the side of the vessel, and found that in shallow places near the head of Lake Superior the temperature was 50 and 51, while in the very deep portions of the big lake, about half way between the upper and lower extremities, the temperature at the same depth from the surface was but 40. Again in the shallow places around Whitefish point and St. Mary's Falls canal there was a rise to 50 and 51, while the thermometer indicated 65 lower down the voyage on Lake Huron, and as high as 70 on Lake Erie. In view of the results of these tests, taken only for amusement, of course, it is no wonder that the people of Lake Superior lay claim to enjoying the benefit of the finest water in the world.

A Reasonable Claim.

There is no doubt now that the whaleback passenger steamer Christopher Columbus has proven one of the leading attractions connected with the World's Columbian Exposition, and present plans are to have her remain in Chicago as an excursion steamer after the fair is closed. Her officers are not unreasonable enough to speak seriously of the claim that she has made 23 miles an hour, but they do say that on a recent trip to Milwaukee, with 160 pounds of steam and an average of ninety-eight turns, she made the run from breakwater to breakwater, which they figure at 86 miles according to the course followed, in 4 hours and 19 minutes. This would be at a rate of speed a little less than 20 miles an hour, or to be exact 19.8 miles. The capacity of this vessel for excursion purposes is enormous, and can only be realized by observing from the deck the stream of passengers passing from the gang planks at either end of the route between Van Buren street and the fair grounds. On the boat's three spacious decks 2,000 people do not appear more crowded than as many hundred on an ordinary excursion boat, but when this mass of living freight is hurried ashore the scene is wonderful.

Coal and Ore Shipments Almost Equal to Last Season.

The St. Mary's Falls canal report for August furnishes some figures for both vessel owners and shippers to ponder over. They prove conclusively that even had there been a reasonable increase in the movement of freight of all kinds this season, the vessel tonnage would be found to be largely in excess of requirements. The active work of the shipyards has at last shown its effect in a most forcible manner. It will be surprising to learn that during the month of July just passed the shipments of hard and soft coal from all lower lake ports to Lake Superior alone reached the enormous total of 618,021 net tons, or 76,018 tons more than during July of last year, when the shipments were greater than in any previous month in the history of lake business. It will be even more surprising to learn that the total movement of freight of all kinds through the canal to August 1 of this season is but very little short of that of a year ago. In ore the shortage on the same date as compared with last season is but 329,704 net tons. Vessels have been carrying a very large amount of freight at the low rates that have prevailed for some time past, as shown by the following tables :

LAKE SUPERIOR COAL AND ORE MOVEMENT.

	Coal up, net tons.	Ore down, net tons.
August 1, 1892	1,557,791	2,256,497
August 1, 1893	1,501,210	1,927,793
Shortage	56,581	329,704

Freight of all kinds passing through the canal during the month of July, 1893, aggregated 2,017,183 net tons, of which 1,297,762 tons was east-bound and 719,421 tons west-bound. During July, 1892, the total movement of freight was but 1,926,210 tons, so that the increase in July of this year is 90,973 tons. The traffic during the month just passed was divided as follows:

	East-bound.	West-bound.
Coal	.....	618,021 tons.
Flour	1,042,845 bbls.	250 bbls.
Grain	.....	.....
Corn	186,729 bu.	.....
Wheat	4,981,064 bu.	.....
Building stone	3,055 tons.	.....
Copper	15,466 tons.	.....
Manufactured iron	.....	20,946 tons.
Iron, ore	836,327 tons.	.....
Iron, pig	4,545 tons.	.....
Salt	.....	21,498 bbls.
Silver, ore	420 tons.	.....
Unclassified freight	17,086 tons.	49,321 tons.
Passengers	2,445	2,906

Shipments of freight of all kinds through the canal from the opening of the present season to Aug, 1, aggregated 5,113,178 net tons, as against 5,390,134 tons on the same date last year. This certainly shows a large general business to and from Lake Superior this year, when it is considered that there was no canal business in April this season, on account of the late opening, while in April, 1892, the freight movement footed up 256,977 tons.

An Over-production of Tonnage.

The fact that the present depression in lake shipping is due about as much to an over-production from the ship yards as to the demoralized condition of general business is beginning to dawn upon the vessel owners in a most forcible manner. In proof of this, the official statement of the freight movement through the St. Mary's Falls canal, which form a most reliable basis to work upon, shows that, notwithstanding the late opening of navigation this season, the shipments of coal, hard and soft, to Lake Superior ports on July 31, were but about 50,000 tons short of the shipments on the same date a year ago, while the amount of ore brought down from Lake Superior was in round numbers only 300,000 tons less. It may be claimed that Marquette shipments of ore, which are at present unusually large, on account of an advantageous rail freight, are drawn from Escanaba, and that there is a corresponding loss in Lake Michigan business, but this is only a small item, in viewing the question from its broad side, and the fact remains that with all the low freights the volume of business in ore, coal, grain and flour has been immense. Then there is also the wonderful movement of 618,021 tons of coal to Lake Superior ports alone during the month of July.

These shipments of coal, which have proven a support to the low freight market for several weeks, and which have been prompted largely by low charges, seem destined to curtailment, however, and in this respect the market has suffered an additional set-back during the past week. Among the big soft coal shipping firms, it is announced that the Sunday Creek company, which has a very large working capital, has quit, almost entirely, the movement of lake coal, and the Northwestern Fuel Company has given out the announcement that its shipments in August will not be more than 20,000 tons, as against average monthly shipments of about 80,000 tons. It can be truthfully said, therefore, that a number of boats from which crews have been discharged during the past week are tied up in earnest, and will remain at the docks until improvement is in sight.

A Distinguished Visitor.

Mr. James Howden of Glasgow, the inventor of the Howden system of forced draft, in use on the Atlantic liners Paris and New York, and the lake steamers Virginia, Pioneer and City of Alpena, visited Detroit and Cleveland during the week, on his way to Philadelphia after taking part in the International Engineering Congress at Chicago. In Detroit Mr. Howden visited Mr. Frank E. Kirby of the Detroit Dry Dock Company, who is the representative of the Howden system on the lakes, and in Cleveland he was the guest of Mr. W. D. Kearfott, who represents Henry R. Worthington of New York. The new American line ships, which are being built by the Cramps of Philadelphia, and which will be fitted with the Howden apparatus, will have six double-ended boilers, with eight furnaces each, or fifty-two furnaces in all, so that in these vessels also there will be a grand opportunity for demonstrating the merits of the system, which has attracted so much attention. Mr. Howden says that all plans for the two new American boats are completed, and they are to develop 21,000 horse power each, but during his stay in Philadelphia on the way to Chicago, he had no opportunity to examine technically the plans for machinery, but was told that double engines were to be of the quadruple type with four cylinders.

Canada's Canal Gates.

The plans for the lock-gates for the Canadian canal at Sault Ste. Marie are now on view at the department of railways and canals, Ottawa. It is expected that the total cost of the gates will not fall short of $100,000. There will be besides the main gates at each end of the lock, guard gates also, and an additional set of guard gates at the lower or eastern end. The two lower main gates will each be 44 feet 6 inches in height, and the lower guard gate 27 feet 6 inches. The upper main gate and the upper guard gate will each be 29 feet 6 inches in height. By this arrangement it will be always possible to pump the lock dry in order to set right anything that may get out of order with the filling and emptying valves, or any of the other mechanism of the lock below the low level.

At the Water Commerce Congress in Chicago last week the lakes were not well represented, and yet the discussion attending subjects connected with lake commerce and the question of a ship-canal to the Atlantic seaboard attracted more attention than any of the numerous water-way schemes that were evidently supported by many able advocates. These meetings tend to exemplify the inevitable conclusion that sooner or later a deep waterway will be opened from the lakes to the Atlantic.

Capt. J. C. Arnold, a veteran lake ship builder, died at Muskegon, Mich., at the age of eighty.

Around the Lakes.

George S. Wright, known as Banker Wright, died at his home in Cleveland last week. At one time he was a shareholder in a number of lake vessels, and held a part of such interests at the time of his death.

Just as the last form was being printed last week it was learned that the names of the two northern line passenger ships the engines of which were illustrated in that issue of the REVIEW, would be North America and North West. Great Northern and Great Western would, it seems, have been more suggestive of uniformity.

The river reporters at Detroit and Port Huron object to the statement that the Vance was reported with the Samoa after she was sunk, as a reflection of the care they take in reporting vessels. As a matter of fact the river service this season has been very good, and even if such a mistake was made it was a matter of habit.

Talk of an indefinite suspension in the constructing of whalebacks seems to have been a little previous, as in spite of the depression which has put an end to all thought of new freight vessels in other yards, Capt. McDougall says work on the boat at present on the stocks at West Superior will be resumed shortly.

The long distance telephone is instantaneous, and as the American company has opened an office in Cleveland, vessel owners can talk with their correspondents at Detroit, Buffalo and other places, with advantages over telegraphy in many cases. Appointments are made for conversations free of charge, and the offices are open day and night. By means of cabinets privacy is secured. The Cleveland office is at No. 197 Superior street.

Thc lakes can now boast of a hydrographic office, located at No. 1621 Masonic building, Chicago. Although it will not furnish information of icebergs and storm areas, as do the coast offices, yet it will prove valuable to captains of lake vessels who will take the trouble to call on the officers occasionally. Nearly 8,000 charts of all the waters of the earth are kept on hand for free use of navigators, and sailing directions will be given when requested.

Trade Notes.

No. 1, Vol. 1 of The Bulletin, published at Detroit, Mich., has been received. It is from the Penbertlay Injector Company, and incidently mentions that company's injector. If you will send your name on a postal card it will probably be added to the mailing list of the new publication.

The Berlin Iron Bridge Company, of East Berlin, Conn., has received the contract for the new power station for The Atlantic Improvement Company, Astoria, L. I. There will be two buildings, a boiler house 62 feet wide and 85 feet long, with a dynamo room 70 feet wide and 130 feet long. The dyamo room is controlled by a traveling crane, to be furnished by the same parties.

The American Shipmaster's association, New York, classed last week the American three-masted schooners Dora Matthews, Geo. E. Dudley, Laura and James E. Bayles, British barkentine Africa, British barks G. S. Penry, Wm. Wilcox and Holland, and the schooner Mary Rose, American barks Gerard C. Tobey and Martha Davis, Swedish bark Hedvig and Russian schooner Karl Johan.

It was reported that the Pawling & Harnischfeger steering gear was removed from the Hand & Johnson tug at Buffalo, but such is not the case. The following letter furnishes a good denial: "The machine works| all right and is almost universally pronounced the leading gear out for tug boats. Its smooth running and noiselessness surprises every one. Mr. Ash, president of the company, a very practical man, and Mr. Hand both declare it to be what they have been looking for."

Output from the Mines.

On the 3rd inst. shipments of ore from Two Harbors aggregated 520,152 tons, of which 258,245 tons was from the Chandler mine, 217,795 from the Minnesota, 21,643 from the Canton and 9,917 from the Cincinnati, 9,338 from the Franklin and 1,213 from the Hale. On July 30 the total from Ashland was 653,023 tons, divided among the different mines as follows: Ashland 26,465 tons, Aurora 99,279, Colby No. 2 17,540, Tilden 66,236, Germania 4,975, Iron Belt 7,544, Montreal, south vein 1,347, Montreal, north vein 24,175, Brotherton 14,643, Comet 5,035, Carey, west 26,333, East Norrie 49,751, Eureka 20,867, Newport 57,410, Norrie 125,414, Pabst 79,520, Sunday Lake 17,524, Davis 7,314, Jack Pot 1,651.

Tips from the Man on the Dock.

At different times there has arisen considerable discussion over the alleged throwing of blades from sectional propeller wheels. Every now and again a ship makes port minus a blade or two and all hands are unanimous in the assertion that "they never touched a thing, she just threw it off in clear, deep water." Singularly enough we never hear anything about solid wheels throwing away their blades like a lobster shedding his claws. Now under ordinary circumstances the sectional wheel is the stronger, because the root of the blade being nearer the tip, the leverage tending to break the blade is less. Another reason is that in order to get sufficient base to afford room for bolts, the hub must be increased in dimensions, so that the width of blade at the base is generally much greater than in the solid wheel. I have always been something of a sceptic concerning this business and I claim that no sectional wheel ever discarded its blades without at some time or other striking an obstruction. It does not follow by any means that the shock and the rupture should be co-incident. The solid wheel would probably simply let go at the time and that would end it, but the sectional wheel being necessarily stronger would hang on and let go later. So the other day hearing a good deal of talk concerning the blade-throwing habits of a certain steamer, I armed myself with a few of the leading points and betook me to a well known mechanical engineer in this city to secure his opinion. It is unnecessary to say here that all the discarded blades had brokeu at the same point—close up to the flange. So listen to the words of wisdom: "The area of metal at the fracture is 140 square inches. The force necessary to break this, applied at the tips of the blade, would be 18,440 pounds. The total effort of the engine at the radius of the fracture was 105,665 pounds, which, divided among four blades, gives 26,416 pounds on each, or equal to a load at the tip of only 6,600 pounds, as against the 18,440 pounds which the blade was capable of sustaining." It appears, then, that the blades were actually almost three times as strong as it was necessary to have them according to the figures. Of course no builder would think of sailing so close to the wind as to make a wheel without large allowances of strength, to provide for striking logs, floating ice, etc., but I had no idea that there was any such excess as appears here. "It should be borne in mind too," said my expert informant, "that I have assumed that the whole force exerted by the steam was transmitted to the wheel without loss—a condition impossible of attainment, as the loss varies from 5 to 15 per cent. according to the type of engine, etc., and more over I have assumed the maximum duty ot the engine in question. It may be said with safety, then, that although owners, skippers and engineers who claim to have thrown blades away without touching anything may be sincere in what they say, as they have no positive knowledge to the contrary, they are only placing themselves in a position to invite the ridicule of those who hrve looked into the subject, when they make such claims.

* * *

Since I started to look up this wheel business I found one instance where a new steamer with sectional wheel had parted with several blades (thrown off, of course), and in deference to the owner's wishes the builder had made new ones very much heavier, but the lobster act continued. The owners grumbled when the bills came in and thought that while the blades seemed too light the bills seemed too heavy. Finally a set of blades lighter than any of the previous ones were fitted and they are still there and in their thirdseason. It is only fair to say that some changes took place in the crew at this same time, beginning with the bridge and extending to the engine room, and possibly this may have had something to do with it. It has struck me too that possibly the putting on of the blades had something to do with their going or staying.

* * *

By the way, one of the officers of the American Steel Barge Company told me a little story the other day bearing on this subject. One of the two steamers sent by that company to the seaboard lost a couple of blades from her wheel. To emphasize the statement that "she never touched anything," both captain and engineer declared that they were sitting aft when suddenly they saw one of the blades fly out of the water, describe a parabolic curve, give a "kerplunk" and down she went. Their tale might have been accepted if they had not taken the last remaining grain of probability out of it by adding that while they looked at each other in astonishment, another blade did the same thing! Perhaps some of the fellows who have "been there themselves" may masticate this, but I confess it a little too tough for me.

Water Commerce Congress.

In the Art Palace, Chicago, the same building in which the International Engineering Congress was assembled last week, there was held also the Water Commerce Congress, which was another gathering of engineers brought about by the officers of the World's Congress Auxiliary. The attendance at the several meetings, which began on Tuesday and closed on Saturday, was quite large, and the discussion at one of the sessions, that of Thursday, had special reference to lake commerce. The representation from the lakes was small, however, and it was unfortunate that such was the case, as the meeting presented an opportunity to give widespread publicity to the importance of lake shipping. Messrs. George Clinton, M. M. Drake and Wm. Thurstone of the Buffalo Merchant's Exchange represented that body in the congress, and Secretary S. A. Thompson of the Duluth Chamber of Commerce, W. Y. Wisner of Detroit and Chauncy N. Dutton of Chicago were among other delegates from lake cities. The Buffalo committee was at the meeting for the purpose, undoubtedly, of taking note of anything that might be said regarding a canal outlet for commerce from the lakes to the seaboard, as Buffalo is not friendly to any scheme that will deprive it of its terminal business, and Mr. Dutton's object in attending was to boom the North American Canal Company, which proposes to provide deep water navigation from Lake Erie to the seaboard, having outlets by way of the lower St. Lawrence and of New York. Mr. Thompson took for his theme "The Economic Value of a Ship canal from the Great Lakes to the Seas," and his position, as is well known, was in favor of the route which proposes a ship canal around Niagara falls on the American side, opening up Lake Ontario; then the deepening of Oswego river for some distance above its mouth, the use of Oneida lake, furnishing about 20 miles of deep water navigation, and finally a canal down the Mohawk valley to tide water in the Hudson. The speaker prefaced his remarks on the canal scheme with the great fund of information which he has collected within the past few years on the immense volume of lake commerce, and the cost of freight charges by water as compared with rail charges. "The time will come," he said, "when the towing will be operated as a railroad is now operated. Steambarges will be notified by wire that a loaded barge is waiting at this port and an empty is wanted at that one. A 20-foot canal to the seaboard will bring about the construction of steamers of 5,000 and 6,000 tons and will cut the present cost of moving freight in two parts." Mr. Thompson evidently had the plans of the American Steel Barge Company in mind when he gave utterance to this sentence, which, by the way, is not in accordance with the views of most practical vessel owners as to the boats of the future, but he is nevertheless entitled to a great deal of thanks for the labor of presenting infornation of a general character to this and other meetings of its kind, at which he is always found actively at work in the interest of the lakes.

Chauncey N. Dutton of the North American Canal Company, recently incorporated in Canada, followed Mr. Thompson with an explanation of the routes to New York and Montreal, by way of the Welland and St. Lawrence, proposed by his company. Mr. Dutton's main argument was that the United States would furnish commerce sufficient to meet the immense expenditure of money involved in the scheme proposed by the North American company, and that Canada's five millions of people would add enough business to bring a return in profit on the investment.

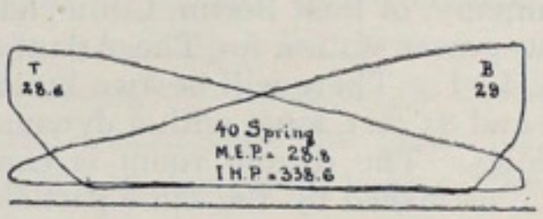
Wooden Freight Steamer George Stone.

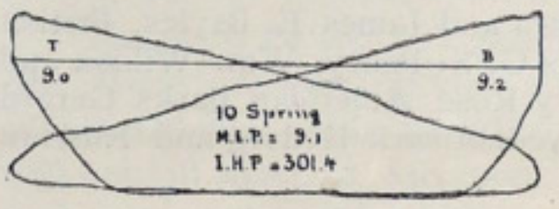
Two sets of indicator cards printed herewith were taken recently from the engines of the steamer George Stone on her maiden trip across Lake Erie. The boat was built by F. W. Wheeler & Co. of West Bay City for M. A. Bradley and others of Cleveland, and on the trip referred to the engines worked perfectly, averaging about ninety revolutions per minute and consuming about 1,300 pounds of coal per hour with an average speed of about 12 miles an hour. The steamer has two masts, schooner rigged, and her principal dimensions are: Length over all, 285 feet 6 inches; length of keel, 270 feet; breadth, moulded, 40 feet: depth, moulded, 22 feet; depth of hold, 19 feet 3 inches; depth between decks, 7 feet 10 inches. She is propelled by a triple-expansion engine with cylinders 17, 28 and 47 inches by 42 inches stroke, driving a wheel 12 feet in diameter and 14 feet pitch, of the builder's own design. The high and intermediate pressure cylinders are fitted with piston valves and the low pressure cylinder has a double-ported slide valve. All valves are worked by Stevenson's adjustable link motion controlled by steam reverse gear, and all steam ports and passages are designed for a piston speed of 700 feet per minute. The bed plate is of the box type, cast in one piece, and the frame work consists of three straight cast iron columns on the starboard side and three "Y" shaped columns on the port side, with large bearing surfaces for the slides, all strongly bolted together with through-bolts. The piston rods are of the best machinery steel. and the crossheads and connecting rods are of the best wrought iron. The crank shaft is of the built-up type, and the crank pin brasses, as well as the main journals, are made of brass inserted with best anti-friction metal strips. All pumps are independent and the exhaust steam from the pumps passes through a large feed water heater with brass tubes, where most of its latent heat is thus given to the feed water. Steam is furnished by two cylindrical return-tubular boilers, 11 feet diameter by 12 feet long, working at a pressure of 170 pounds per square inch. Each boiler has two furnaces of 42 inches diameter, and 184 3-inch tubes, with a grate surface of 44 square feet and a heating surface of 1,550 square feet. The ratio of heating surface to grate surface is 35.3 to 1. The coal bunker capacity is 200 tons. The outfit and general arrangement of cabins, etc., are complete in every respect, and the interior finish is about as fine as that of any boat on the lakes. Capt. George Stone, in whose honor the boat is named, was aboard on the maiden trip. She is commanded by Capt. M. Mulholland, and Mr. F. Williams is the chief engineer. The owners of the Stone are of the opinion that they have one of the finest and strongest wooden boats on the lakes and the officers are highly pleased with her behavior.

S.S. George Stone.

Lake Erie, 4 p.m. July 21st 1893.

Cylinders. 17¼"-28"-47"
Stroke.....42 in.
Boiler press..170 lbs
1st Receiver...53 lbs
2nd Receiver....5 lbs
Vacuum.....24 in.
Cut off, H.P. Cyl....0.4
Revolutions....90
I.H.P. Total....986.2





S.S. George Stone.

Lake Erie, 5 p.m. July 21st 1893.

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Stroke.....42 in
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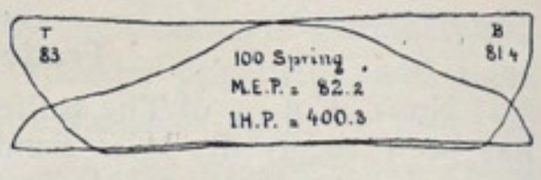
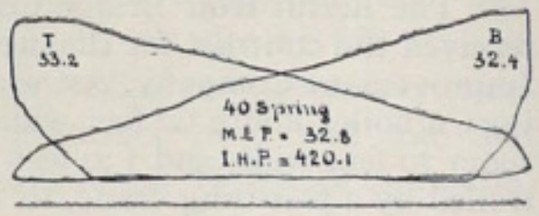
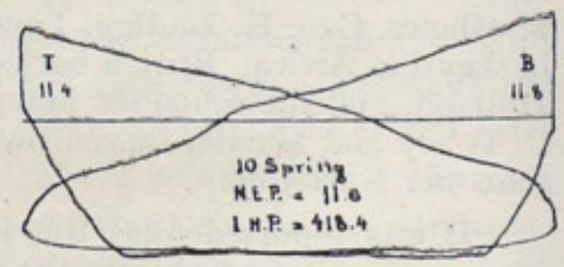
1st Receiver...63 lbs
2nd Receiver....9 lbs
Vacuum.....24 in
Cut off H.P. Cyl....0.65
Revolutions...98
I.H.P. Total...1238.8







Grain Freights and the Money Stringency.

WESTERN OFFICE, MARINE REVIEW,
No. 701 Phoenix Building, CHICAGO, Ill., Aug. 10.

A Buffalo paper stated the other day that there was a good deal of buncombe about the shortage of money at Chicago in moving grain. The writer attempted to figure out by certain well-known conditions that there was nothing in the stories about the lack of funds. It was quite natural that he should attempt to do so, but the conditions now prevailing in the grain trade can not be argued away nor explained by the usual methods of trade. So far as Chicago is concerned, New York banks have been suspended for the past six weeks, as it has been impossible for Chicago banks which had big balances in New York to draw out their funds. Personal messengers, express drafts and all the other means of getting actual currency from one part of the country to the other have received no attention from the New Yorkers, who have laid down and said they could not and would not let the cash go. It seems a pity that with 20,000,000 bushels of wheat in Chicago elevators constantly pressing the price lower and lower, with Europe anxious to buy this wheat, with shippers eager to handle it at a good round profit, and with boats lying idle for lack of cargoes, that a condition of the money market should exist which would stop all this business, yet such is the case. Of course, such an abnormal condition can not continue long. Hard times may be here to stay, but business will adjust itself to the new conditions and will not be paralyzed by the fact that cash is in the banks of one city and not in those of another. I heard the other day of a prominent board of trade man taking $25,000 in currency to a bank and exchanging it for gold, which he lugged over to a safety deposit vault to be dumped into his drawer. He could have made 30 to 35 per cent. for a year on his money without running any risk at all, but he deliberately threw away the chance because he was scared. It is said that every safety deposit drawer in Chicago has been rented in the last two months and they are all overflowing with gold and currency. Why a man should hide his money when it is worth more than it has been for twenty years and more than it may be again for twenty years more is difficult to explain. It is not as reasonable as the action of the dog carrying away a lot of meat bones for future use.

In regard to fast time the steamer City of Toledo proved quite a disappointment when she was tested alongside of the Chicora on the run to St. Joe. It was a straight-away race for both boats however much it may be denied. The Toledo made excellent time for about an hour, and then her steam dropped down and she lagged the rest of the way over the course, being easily beaten by 14 minutes. The City of Toledo seems to be a splendid runner for short distances, but when it comes to keeping right at it, hour after hour; does not get there. The same thing is true of most passenger boats, Capt. Burns of the Owego, says. On his last trip down the new Canadian steamer City of Collingwood waited two hours to get a chance to match her speed against the Owego. It was an unequal match, for the Union line greyhound was out of sight after five hours' run.

Buffalo's Coal and Grain Trade.

Special Correspondence to the MARINE REVIEW.

BUFFALO, N. Y., Aug. 10.—The record of dullness and vessels laying up may be getting monotonous, but it is still the most current topic of conversation. The difficulty, however, is in other ends of the lake route rather than here. Buffalo was never busier. There have been 100 vessels here in two days, during which time 1,250,000 bushels of wheat have been received and other freight to correspond. Coal shipments are slow, but they are up to last year and will probably keep up. The difficulty is that the dropping off of business in some quarters has revealed to us the immense size of the lake fleet.

Begging Detroit's pardon, there are people here who have a sort of negative wish to see that proposed canal built across Canada between Lake St. Clair and Lake Erie. The announcement made so positively last week is doubtless anything but an assurance that it will be built, but if it is, the cost and utility of such canals will be demonstrated in a way that could never be the case on paper. A canal that merely cuts off a few hours of a vessel's ordinary trip seems anything but necessary, but if it can be made to pay it will show that doubters were mistaken. So long as failure wouldn't be our funeral there is some desire to see the experiment tried.

The committee of the Lake Carriers' association, which is looking after the lighting question, has forwarded to the lighthouse board a list of seven of the most needed lights chosen from the larger list authorized by Congress, but for which no appropriation has been made. Following is the list: Light and fog signal on Forty-mile point, Lake Huron; range lights at Death's Door passage, entrance to Green bay; moving the main Chequamegon light, near Ashland and establishing fog signal; fog signal at Portage lake ship canal; light and fog signal on the south-east end of North Manitou island; light and fog signal at Squaw point, little Bay de Noquette; light on the south end of South Bass island, Lake Erie. The lighthouse board has acknowledged the receipt of the list and will doubtless adopt it.

I was struck by a remark in an item from the Boston Herald lately recording the fact that the ship Great Admiral, the last of the Weld fleet, was twenty-four years old, or double the average life of wooden ships. This may not be exactly true of ocean craft, but it calls attention to the much greater chance a lake vessel has of continued existence than an ocean vessel. The schooner Richard Mott was built in 1851, the Fulton in 1854, and the Plymouth in 1853. All rate A 2. The May Richards, built in 1856, rates A 2½. Still we think our lake vessels are subject to a great many accidents.

Kingston Harbor Matters.

Special Correspondence to the MARINE REVIEW.

KINGSTON, Ont., Aug. 10.—The shipments of grain out of Montreal for this season up to July 31st amounted to 12,047,004 bushels, against 9,338,947 bushels for the same period last year. The exports are said to be the largest on record.

The application of electricity in the opening of lock gates has been successfully tried at Beauharnois canal and has proved highly useful. The gates can be opened and closed with much greater exactness and efficiency than before.

There is a scarcity of coal at the south shore points just now. The vessels have done well this year, the rate being 30 cents from Oswego, 5 cents higher than hithe.to, because of the rush. Out of this freight the vessels had to pay tolls.

The steamer Algonquin is credited with covering the distance from Kingston to Fort William and return in twelve days and this includes loading time. This is good time for a Canadian freight steamer and beats the previous record by two days.

There is a general feeling of satisfaction here, now that President Cleveland has concluded to put into force the reciprocity in wrecking act as the St. Lawrence river has been the scene of most quarrelling among opposing wrecking interests. Very frequent have been the accidents among river crafts and it was the general thing to have to wait, sometimes days, to secure the permission of the respective governments to do rescue work. The abolishment of this practice will give despatch to necessary work.

Campania and Great Eastern.

The following comparative statement of particulars of the Great Eastern and Campania is taken from Dr. Elgar's paper on "Fast Ocean Steamships," read at a recent meeting of naval architects of Great Britain at Cardiff.

Particulars.		Great Eastern.	Campania.
		Ft. In.	Ft. In.
Length over all		692 0	622 0
Length between perpendiculars		680 0	600 0
Breadth moulded		82 2	65 0
Depth moulded to upper deck		58 0	41 6
		Tons.	Tons.
Register tonnage	Gross	18,915	12,950
	Under deck	18,837	10,267
		Ft. In.	Ft. In.
Load draught		30 0	27 0
Passenger accommodation	1st class	800	600
	2nd class	2,000	300
	3rd class	1,200	700
Indicated horse power of engines		about 8,000	about 30,000
Speed at sea in knots at full power		14 to 14½	22 to 23

The Great Eastern had two separate sets of propelling machinery, one driving a screw propeller and the other a pair of paddle wheels. The screw engines were the most powerful, and would indicate up to 4,500 horse power at sea. The paddle engines indicated 3,500, so that the maximum indicated horse power was about 8,000. This power gave a speed of 14 to 14½ knots at sea, with a coal consumption of about 400 tons per day. There were four cylinders to each set of engines, those of the screw engines being 7 feet in diameter with a stroke of four feet, and those of the paddle engines 6 feet 2 inches in diameter with a stroke of 14 feet. The screw was four-bladed and had a diameter of 24 feet with 44 feet pitch. The paddle wheels were 56 feet in diameter. The working steam pressure appears to have been about 20 pounds, and steam was cut off in the cylinders at one-third of the stroke. The boilers were tubular and of the square-box type, and they were double-ended. There were ten boilers in all, 18 feet long, 17 feet 6 inches wide, and 15 feet high, with 112 furnaces.

The Campania has also two separate sets of propelling machinery, but in her case they drive twin-screws. The propelling power is fully three and a half times that of the Great Eastern, and the speed more than 50 per cent. greater. This increase in power and speed is obtained with a daily coal consumption that is but little in excess of the Great Eastern's. There are five cylinders to each set of the Campania's engines, and they work three cranks. There are two high-pressure and two low-pressure cylinders, and the high-pressure cylinders are placed upon the low-pressure. The cylinders are 37 inches, 79 inches, and 98 inches in diameter respectively, with 69 inches stroke. The screw propellers are smaller than that of the Great Eastern. The boilers are thirteen in number, twelve of them being double-ended and one single-ended, with 100 furnaces, or 12 furnaces less than in the Great Eastern.

MARINE REVIEW.

DEVOTED TO THE LAKE MARINE AND KINDRED INTERESTS.

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The books of the United States treasury department contain the names of 3,657 vessels, of 1,183,582.55 gross tons register in the lake trade. The lakes have more steam vessels of 1,000 to 2,500 tons than the combined ownership of this class of vessels in all other sections of the country. The number of steam vessels of 1,000 to 2,500 tons on the lakes on June 30, 1892, was 321 and their aggregate gross tonnage 534,490.27; in all other parts of the country the number of this class of vessels was, on the same date, 217 and their gross tonnage 321,784.6. The classification of the entire lake fleet is as follows:

Class.	Number.	Gross. Tonnage.
Steam vessels	1,631	763,063.32
Sailing vessels	1,226	319,617.61
Canal boats	731	75,580 50
Barges	69	25,321.12
Total	3,657	1,183,582.55

Tonnage built on the lakes during the past five years, according to the reports of the United States commissioner of navigation, is as follows:

	Number.	Net Tonnage
1888	222	101,102.87
1889	225	107,080.30
1890	218	108,515.00
1891	204	111,856.45
1892	169	45,168.98
Total	1,038	473,723.60

ST. MARY'S FALLS AND SUEZ CANAL TRAFFIC.

	St. Mary's Falls Canal.			Suez Canal.		
	1892.	1891.	1890.	1892.	1891.	1890.
No. vessel passages	12,580	10,191	10,557	3,559	4,207	3,389
Ton'ge, net regist'd	10,647,203	8,400,685	8,454,435	7,712,028	8,698,777	6,890,014
Days of navigation	223	225	228	365	365	365

Entered at Cleveland Post Office as Second-class Mail Matter.

IN THE MARINE REVIEW, issue of July 13, some comment was made on the delay in that portion of the 20-foot channel work known as the Bar point section, which is in the vicinity of Amherstburg, Ont. Although it was expected that the work on this section, as well as all other sections, would begin as early as possible after the opening of navigation, it was well into the middle of July before the contractors were given permission, by action of the Canadian Privy Council, to take machinery and supplies for doing the work into Canada free of duty. In the meantime there was some anxiety about progress on this section of the big channel, and the REVIEW, in the article in question, said in substance that it was hinted that the contractors, Messrs. L. P. and J. A. Smith of Cleveland, had prompted delay, by bringing to the attention of Mr. George Gott, collector of customs at Amherstburg, the question of the dredging being in Canadian waters. There was no intention of intimating that Mr. Gott, who is known to be one of the most obliging and faithful customs officers in Ontario, had done anything to delay the improvement, as the article was written after a talk with one of the Messrs. Smith, who gave no serious consideration to the claim that they were not in a hurry to go on with the work. It is but just to Collector Gott, who is not looking for credit in the performance of duty, but who understands the benefits of this improvement to both Canada and the United States, to say that he did all in his power, within the faithful performance of duty, to secure the vigorous prosecution of the work, and the delay was due to the matter having to go through the regular channels of government supervision.

A SHORT time ago the weather bureau established on the lakes a branch for the collection of information regarding currents, winds, waves, etc., and now the hydrographic service has located an office in Chicago. The representatives of the weather bureau have gone along modestly with their work, on the basis that through the assistance of masters and owners of vessels they may fathom some of the mysteries connected with these great bodies of fresh water. The Chicago office of the hydrographic service will do well to act likewise, bearing in mind all the time that success with their work will depend largely upon the assistance they will get from the men who sail the ships, and who, it must be remembered, lay no claim to any knowledge of the seience of navigation. Simple things and simple methods must be used here to create an interest in the work undertaken by both of these branches of the government service. As a result of the assistance given the weather bureau by vessel masters who have thrown hundreds of bottles overboard in all parts of the lakes during two seasons past, the bureau is now about to publish a chart showing the drift of all of the bottles that have been found, and indicating the direction of currents on the several lakes. This map will at least be interesting to the men who have had a hand in creating it, and will be an incentive to further assistance from them. Mr. N. B. Conger, marine agent of the weather bureau, who is located at Detroit, is about to distribute more of these bottles in continuation of this work, and should have the assistance of all vessel captains.

WHEN it was announced some time ago that the New York Ship Building and Engine Company had been organized under the laws of New Jersey, it was not generally understood that this company is intending to construct high speed torpedo boats, yachts, and other speedy craft, entering the same kind of business as Yarrow, Thorneycroft and others on the other side of the ocean. It would seem that there is room for such enterprise, the more so on account of the semi-official announcement that the new concern will be supported by the navy, as far as the officers of that service can consistently, aid private corporations of its kind. The company acquires the business of Gardner & Mosher, and starts out with the exclusive right to manage and sell the new type of hull, quadruple expansion engine, and water tube boiler with which the name of that firm has been connected. The New York office of the company will be at No. 1 Broadway, and the works at Hoboken, N. J. Names connected with the management of the company are a guarantee of its strength. The directors are Messrs. Edwin A. Stevens, George E. Weed, William Gardner, John B. Roach, William Rowland, James F. Cox and C. D. Mosher.

Stocks of Grain at Lake Ports.

The following table, prepared from reports of the Chicago board of trade, shows the stocks of wheat and corn in store at the principal points of accumulation on the lakes on Aug. 5, 1893:

	Wheat, bu.	Corn, bu.
Chicago	18,846,000	1,544,000
Duluth	4.327,000	.....
Milwaukee	1,065,000	3,000
Detroit	871,000	2,000
Toledo	1,467,000	210,000
Buffalo	1,741,000	233,000
Total	28,317,000	1,992,000

At the points named there is a net increase for the week of 3,830,000 bushels of wheat and a net decrease of 418,000 bushels of corn.

Hendricks' Architects' and Builders' Guide and Contractors' Directary of America for 1893-4 has been received. It contains 170,000 names and addresses, classified under 800 headings. It is complete and correct and the only work of its kind published. It is worth many times its cost for circular purposes alone, not considering its value as a work of reference. By addressing S. E. Hendricks & Co., No. 52 Broadway, New York, a copy will be sent for examination. The price is $5.

INTERNATIONAL ENGINEERING CONGRESS.

Assemblage of engineers from all parts of the world—A full report of the several sessions of the branch devoted to marine and naval engineering and naval architecture.

Nearly every civilized nation was represented at the International Engineering Congress held at the Art Palace on the lake front in Chicago last week, and the assemblage of engineers, which has been looked to for some time past as one of the features of the World's Columbian Exposition, was truly the greatest ever witnessed in the world. As readers of the REVIEW are most interested in the proceedings of the division of marine and naval engineering and naval architecture, this account will be confined to the proceedings in that division, although it will be necessary to refer briefly to the opening general session of all the divisions.

The Hon. C. C. Bonney, president of the World's Congress Auxiliary, delivered an address of welcome, which was echoed by Mr. Octave Chanute, first vice chairman of the general committee of the International Engineering Congress. Addresses were also made by Sir Benjamin Baker of England, builder of the Forth bridge, Baron Quinette de Rochemont of France, C. O. Gleim of Germany, and several other distinguished foreigners, and also by the chairmen of the different divisions of the congress, namely: Mr. William Metcalf, division A, civil engineering; Mr. Eckley B. Coxe, division B, mechanical engineering; E. G. Spilsbury, division C, mining engineering; Henry M. Howe, division D, metallurgical engineering; Prof. Ira O. Baker, division E, engineering education; Major Clifton Comly, U. S. A., division F, military engineering, and Commodore Geo. W. Melville, U. S. N., division G, marine and naval engineering and naval architecture. The general meeting then adjourned and the seven divisions of the congress opened sessions immediately afterward in the various halls.

MARINE AND NAVAL ENGINEERING AND NAVAL ARCHITECTURE.

About forty-five papers from the most distinguished representatives of the ship building industry in Great Britain, France, Germany, Spain, Italy and the United States were contributed to the division of marine and naval engineering and naval architecture, and thirty-three of them were in print, while less than half a dozen of the whole number of papers put down on the programme failed of appearance. The foreign attendance was more than equal to that in other branches, and was fully up to what was expected in consideration of the diversified interests represented in the general congress. Among the eminent gentlemen in attendance at this branch of the congress may be mentioned General L. de Bussy, inspecteur general du genie maritime of France; Dr. Francis Elgar of London, vice president of the Institution of Naval Architects and delegate from that institution to this congress; Colonel Nabor Soliani, of the corps del genio navale of Italy; Professor Carl Busley of the Imperial German Naval Academy at Kiel, Germany; Antonio de Barron Boneto of the Brazilian navy; Mr. James Howden of Glasgow, inventor of Howden's system of forced draft; Commodore Melville, engineer-in-chief U. S. N., chairman of the division; Passed Assistant Engineer McFarland, secretary of the division; Commodore Charles H. Loring, U. S. N., formerly engineer-in-chief of the navy; Geo. W. Dickie, Esq., manager of the Union Iron Works, San Francisco; Warren E. Hill, Esq., vice president of the Continental Iron Works, Brooklyn, N. Y.; Naval Constructor Varney, U. S. N.; Geo. W. Street, assistant constructor U. S. N.; Chief Engineer Moore of the navy; Chief Engineer David Smith, U. S. N.; Prof. W. F. Durand of Cornell University, Ithica, N. Y.; Prof. Ira N. Hollis of Harvard University; Prof. W. F. Spangler of the University of Pennsyivania; Col. E. A. Stevens, superintendent of the Hoboken Ferry Boat Company, New York; T. A. McElwell, Esq., superintendent of the Vacuum Oil Company, Rochester, N. Y.; Charles Ward, Esq., inventor of the Ward water tube boiler, Charleston, W. Va.; Edward E. Roberts of the Roberts Water Tube Boiler Company; H. B. Roelker, Esq., of No. 41 Maiden Lane, New York, proprietor of the Allen dense air ice machine; Charles W. Whitney of New York City; Charles A. Moore of the well-known firm of Manning, Maxwell & Moore, Liberty street, New York; Asa M. Mattice, consulting engineer of Cambridgeport, Mass.; Col. David P. Jones, chief engineer U. S. N., retired; John M. Sweeny of Harvey, Ill.; Count de Balincourt of the French navy; Passed Assistant Frank M. Bennett, U. S. N; Chief Engineer John L. D. Bortherwick, U. S. N.; Mr. J. R. Williams, mechanical engineer, No. 60 South Canal street, Chicago; Prof. John Pemberton, U. S. N., associate professor of mechanical engineering, Pennsylvania State College; Capt. Charles H. Manning, superintendent of the Amoskeag Mills, Manchester, N. H.; C. B. Calder, superintending engineer of the Mutual and Menominee steamboat lines, Cleveland: Joseph McMakin, superintending engineer Columbian Iron Works, Baltimore; Chief Engineer Kafer, U. S. N.; Mr. F. W. Grogan, architect of the naval exhibit of the World's Columbian Exposition; E. Platt Stratton, chief engineer surveyor, Record of American and Foreign Shipping, New York; Mr. Frank B. King, superintendent of the marine department Maryland Steel Company, Sparrow's Point, Md.; Joseph R. Oldham, naval architect, Cleveland; Charles E. Fitch, No. 296 Elm street, Chicago; Alfred H. Raynal, Elizabeth, N. J,; E. N. Jansen, bureau of steam engineering, navy department; P. A. Lennerty, mechanical engineer and naval architect; A. George Mattson, constructing engineer S. F. Hodge & Co., Detroit, Mich.; Henry C. Meyer, Jr., of the Engineering Record, No. 227 Pearl street, New York; Frank M. Dunlap, mechanical engineer, No. 57 Selden avenue, Detroit, Mich.; Theodore G. Hoech, royal Prussian inspector of waterways; D. W. Edenston of Clinton, Ill.; E. T. Sederholm, No. 1629 Fulton street, Chicago; Mr. Hayden Homer Tracy and S. D. Boynton.

DISCUSSION OF PAPERS.

The first session began with an address by Commodore Melville, in which he expressed gratification at the large attendance, and welcomed the foreign guests. He then gave a brief summary of the present condition of matters connected with marine engineering and naval architecture, and sketched briefly the lines along which future progress will probably be made, calling special attention to the fact that it will most likely be on about the same lines as in the past, which have consisted of an increase of steam pressure, an increase of piston speed, better material and, possibly, changes in design to a certain extent. He mentioned that experiments are now being made with steam of 1,200 pounds pressure, and called attention to the possibilities of the coil boiler for enabling great power to be obtained with little weight. He also mentioned in the course of his remarks the death of Dr. Alexander C. Kirk, a member of the advisory council of the division, who had begun a paper on the triple expansion engine, and on which he was engaged at the time of his death.

The first paper was by Sir Nathaniel Barnaby of England on "The Best Ship of War." This was a paper worthy of its eminent author and in brief compass contained the results of the experience of that eminent architect. This paper was discussed by Dr. Francis Elgar of England, Chief Engineer Kafer, of the U. S. N., Professor Durand of Cornell University, Naval Constructor Varney, U. S. N., and several others. Other papers were by Mr. Lewis Nixon, superintending architect of Wm. Cramp & Sons Ship and Engine Building Company of Philadelphia on "The New Vessels of the United States Navy," and "Naval Architecture in the United States" by Benjamin

Martell, Esq., chief surveyor to Lloyds' Register. There was an interesting discussion of these papers, and several of the gentlemen expressed an intention to contribute remarks in writing in time to be published.

Dr. Francis Elgar, the distinguished English architect who comes to this congress as delegate from the Institution of Naval Architects, then read a paper on "The Present Condition of Naval Architecture." This was an eminently valuable paper and contained many points of the greatest interest. The doctor called special attention to the fact that, while at one time it may have been possible to design ships simply from experience gained by long practice, this no longer held, but the successful naval architect of today was the man who had and who must have a thoroughly scientific education as his basis. The meeting then adjourned, leaving several papers over for discussion at a subsequent date.

On Tuesday the first paper was "The Trireme at the Time of the Peloponnesian War" by Herr R. Haack of Berlin, Germany, naval architect and formerly technical director of the Vulcan Iron Works. Although this paper is apparently of remote interest, it proved on reading quite the reverse from the way in which it was treated, and the abstract which was read showed that the complete paper as it will appear in the proceedings will be of great interest. Two papers were then briefly discussed, the same being by General Casimir de Bona, inspector general of engineers in the Spanish navy, on "The Graphic Integration of Rosin" and "Valve Diagrams." Next "The Relation of Speed and Power in Steamers" by Mr. Robert Mansel, the well known architect of Scotland, was discussed by Dr. Elgar, Professor Durand, Mr. McFarland and others. "The Use of Oil at Sea" by Mr. W. J. Millar, secretary of the Institution of Engineers and Shipbuilders in Scotland, was commended as an eminently valuable paper, containing much information, but there was no discussion of it.

"The Vibration of Steamers," by Herr Otto Schlick, consul at the Bureau Veritas at Hamburg, Germany, was a remarkably interesting paper, and elicited a valuable discussion, in which a number of points of great value were brought out. The discussion was by Mr. F. B. King, superintendent of the marine department of the Maryland Steel Company, Col. E. A. Stevens, superintendent of the Hoboken Ferry Company, Chief Engineer Kafer, Professor Durand, Dr. Elgar, Mr. Oldham, Mr. Stratton, chief engineer-surveyor of the Record of American and Foreign Shipping, Col. Nabor Soliani of the Italian navy, Naval Constructor Varney, U. S. N., and Mr. Alfred H. Raynal. In this liberal discussion a number of practical points of great interest were brought out, among which was one by Dr. Elgar, that it has been found that when a ship is longer than twelve times her depth, there is sure to be considerable vibration. Dr. Elgar also spoke of the recent experience of the builders of the big Cunard liner Campania with vibration in that ship and related his personal observations on the subject during trial trips of the Campania. Unusual interest attended this discussion, on account of the subject being comparatively new in meetings of this kind, and Mr. Schlick, who has given a great deal of attention to the question of vibration, was highly complimented on the merits of his paper.

Then came a paper on "Welded Seams" by Mr. Warren E. Hill, vice-president of the Continental Iron Works, which was also very interesting. In response to questions by gentlemen present, Mr. Hill gave additional information of great value. The discussion brought out the fact that a locomotive boiler without any riveted joints at all has been at work for the last four years at their works, and has given entire satisfaction. Mr. Hill believes that in time, as people acquire the same confidence in welded seams as that now possessed by the manufacturers, riveted joints will disappear to a large extent. The paper on "Screw Propulsion," by Mr. Sydney W. Barnaby was discussed by Messrs. McFarland and Kafer, Col. Stevens, Messrs. James Howden of Glasgow, H. B. Roelker and Dr. Elgar. This paper is certainly one of the most valuable that has been presented to the congress, and contains in short space the practical rules which have been deduced from the extended experiments of Isherwood, Froude, Thorneycroft, Yarrow and others. "The Resistance of Ships," by Prof. Riehn of Hanover, Germany, was a subject bristling with mathematics, but containing much valuable and intereseing matter and information. The general opinion was that, as the paper had, unfortunately, been circulated but very recently in advance, a very valuable discussion could not be expected, and therefore none was made.

On Wednesday the first two papers were on the "Rules for Boiler Construction of Various Governments and Registration Societies," written by Nelson Foley, the manager of the Hawthorn-Cuppy Company of Naples, Italy, and the "Government Inspection of Merchant Vessels and the Influence thereon of Registration Societies," by E. Platt Stratton, chief engineer-surveyor to the Record of American and Foreign Shipping. These two papers are of entirely different character, that of Mr. Foley being strictly technical, and discussing the various rules for strength. It is a most valuable paper and will be of the greatest value to marine engineers in the designing of boilers. Mr. Stratton's paper was less technical, but brought out an animated discussion, which was participated in by some fifteen or twenty of the gentlemen present. The fact was pretty thoroughly established that there is a great dissatisfaction with the rules of the steamboat inspection service in this country, largely on account of the fact that they are not sufficiently elastic to provide for progress in marine engineering and ship building. The form of test piece for boiler material was pretty well discussed and the present form condemned. The question of the factor of safety for steam boilors was also discussed, and several eminent gentlemen expressed the idea that the proposition in the Frye bill, of about a year ago, to have a factor of 5, was not desirable, as a lower factor would be entirely satisfactory. This idea, however, was combated very strongly by other gentlemen who had given the matter great attention.

A most valuable paper was that entitled "Auxiliary Machinery for War vessels," by George W. Dickie, manager of the Union Iron Works, San Francisco, Cal. This paper is not only valuable for the splendid review of the subject, and the author's thorough grasp of it, but for his novel propositions in regard to several points. Mr. Dickie's immense experience as the manager of the Union Iron Works for so many years has enabled him to see the defects in existing methods, and he proposes in his paper certain other methods which would materially reduce the complication at present existing aboard ship, with an attendant increase in economy. This paper was discussed by Prof. Hollis of Harvard University, recently an engineer officer in the navy, Mr. Asa M. Mattice, formerly of the engineer corps of the navy, and now a prominent consulting engineer in Boston, Chief Engineer Kafer of the navy, Capt. E. H. Stevens and Mr. A. H. Raynal. To these remarks Mr. Dickie briefly responded. Two papers were then taken up on "Hydraulic Machinery for Maneuvering Guns" by Mr. A. A. Willson, superintending engineer of the Quintard Iron Works, New York City, and "Hydraulic Appliances in Boiler Construction" by Signor G. Migliardi, of the firm of Migliardi Bros., Italy. Both of these papers were of great interest, and received much commendation. They were discussed by Messrs. Raynal, Mattice and Dickie. The other papers on Wednesday's programme were then postponed until Thursday, and it was announced that an evening meeting would be held in order to consider the papers which were accompanied by lantern slides, or rather stereopticon views.

A PLEASANT EVENING MEETING.

The evening session was very much enjoyed and was largely attended. The first paper was by Prof. Durand, professor of marine engineering and naval architecture at Cornell University, on the "Planning and Equipment of a modern Engine Building Plant." As this paper had been printed in advance it was taken as read, and the professor occupied his time describing the splendid series of lantern slides illustrative of the powerful tools used in ship and engine building, as well as large cranes for handling the material, mast shears, and other similar appliances. Remarks were made on some of the tools and appliances at the Union Iron Works by Mr. Dickie, manager of that institution, a special description being given of the hydraulic lifting dock which, from Mr. Dickie's description, seems to be an extremely efficient and economical structure, much more so than the ordinary graving docks. At the conclusion Prof. Durand was warmly complimented on the excellence of his paper and of the lantern slides. In the absence of Mr. Weir, the author of a paper on "Boiler Feed," Secretary McFarland gave descriptions of the lantern views accompanying the paper, Mr. Weir having provided a very complete description of them. These covered the experiments in regard to corrosion in steam boilers and the progress of improvement in regard to devices for feed water for boilers. The slides included views of the very latest devices of this kind, such as those on the Campania and Mr. Vanderbilt's yacht Valiant. The evening's entertainment concluded with a most interesting series of pictures of ice yachts by Mr. Archibald Rogers of Hyde Park on the Hudson, N. Y., the well known enthusiast on yachting matters, and who has recently built one of

the yachts which is to compete as possible defender of the America's cup this season. These views showed the standard forms of the ice yacht, together with some of the earlier types, as well as some beautiful views of winter scenery on the Hudson.

CLOSING DAYS OF THE CONGRESS.

At Thursday's session the papers receiving most attention were "Forced Draft" by James Howden, "Liquid Fuel on Steam Vessels" by Col. Soliani, and "Coil and Tubulous Boilers" by Charles Ward, builder of the tubulous boilers on the U.S.S. Monterey. The main feature of the discussion attending Col. Soliani's paper was with regard to danger of explosion, and in answer to a number of questions on this point the distinguished author expressed the opinion that there was no danger in using the refuse that remains after all of the products of petroleum have been extracted. At present, on account of the high price and of the limited quantity available, petroleum refuse fuel, notwithstanding the many advantages that could be derived from it, cannot be adopted for general use on board ships, at least in the mercantile navy. In war ships its military advantages may lead even now to its partial adoption. The combustion of coal and petroleum refuse combined in the same furnaces gives an easy and simple means of securing, to a certain extent, the advantages of power that can be derived from oil fuel, without endangering the supply of fuel to the ships, as the coal arrangements on board are left unaltered. The combined combustion will therefore probably be the form in which the oil fuel will at first be applied to war ships during the period of transition from coal to liquid fuel. It was alsod agree that petroleum fuel might be kept in reserve for use in emergency where its advantages would overcome the question of cost.

Mr. Howden's paper on "Forced Draft" was considered with that of Henry Benbow, chief inspector of machinery, British navy, on "Effect of Forced Draft in Causing Leaky Boiler Tubes, and the Remedies Therefor." The inventor of the system of draft in use on the New York and Paris went so thoroughly into the subject in his paper that there was little room for extended discussion. Mr. Howden treated the engineers to considerable additional information in extended remarks, however, and after he had finished Mr. Dickie remarked that he noticed that the chairman (Chief Engineer Melville of the U. S. navy) had listened very carefully and would probably require hereafter a guarantee of consumption of fuel, along the line of similar guarantees as to speed and horse-power. Then followed the reading of a portion of Mr. Charles Ward's paper on "Coil and Tubulous Boilers," which was accompanied by supplemental data from Mr. McFarland, from the standpoint of the experience of the United States navy in adopting this type of boiler in the Monterey. There is no doubt that the navy is highly pleased with its experience in this regard. In concluding his remarks Mr. McFarland said that the great question with the tubulous type of boiler is in the life of the tubes, making the general claim that this is but about three years. The following data was presented as the result of tests made by the navy:

	Evap., f. & a., 212° per lb. of coal.	Evap. per sq. inch heating surface.	I. H. P. per ton of boiler and water.	Air pressure, inches of water.
Thorneycroft	11.90	1.40	15.6	Open fire room
	9.72	3.63	40.44	0.5
	8.84	5.51	61.38	3.0
	6.51	6.70	74.65	4.0
Towne	5.82	5.32	33.90	2.0
Cowles	7.45	6.96	61.07	2.0
Ward	7.31	8.62	76.98	2.0
Cyl. D. E.	.....	.....	29.20	2.25
" S. E	10.20	3.08	5.16	0.2
Locomotive	6.62	20.09	71.85	4.95

Mr. E. E. Roberts of the Roberts Water Tube Boiler Company, followed with an extended and most interesting address that showed a wide knowledge of the subject, although, as he explained at the opening, his boiler has not figured largely in government tests, nor in the scientific discussion, as the company has been very busy supplying hundreds of boilers throughout the country, but which are not, of course, for large ships. J. Harvard Biles' paper on "Fast Atlantic Steamers" was not printed in time for the congress, and the discussion attending it was accordingly limited. Other papers considered briefly at Thursday's session, and which were left over from Wednesday were the following: "Problems Confronting the Designer of Naval Machinery, and the success which has been Attained in their Solution" by I. N. Hollis, passed assistant engineer, U.S.N. assistant to engineer in chief; "The Strength of Ships" by F. L. Middendorf, technical director of the Germanischer Lloyds; "Practical Stability Information" by A. R. Liddell; "Diagram of Stability for any Draught and Stowage" by Pedro P. Seoane, commandant of engineers in the department of Ferrol, Spanish Navy.

THANKING FOREIGN VISITORS—THE PROCEEDINGS.

On Friday, the last day given to the divisions for separate discussion, the programme included some very important papers as follows: "Speed Trials" by Archibald Denny, partner in Wm. Denny & Bro., Dumbarton; "Coasting Sailing Vessels of the Adriatic" by Rodolfo Poli, of the firm of Poli Bros., Chioggia, Italy; "Steel Castings for Marine Machinery" by Edwin S. Cramp, superintending engineer, Wm. Cramp & Sons; "Tests of Iron and Steel" by Jas. E. Howard, engineer of tests, Watertown arsenal; "Valves and Valve Gears, for High Speed Engines" by N. P. Towne, chief engineer U. S. N., and consulting engineer to Wm. Cramp & Sons; "Western River Steamers" by J. M. Sweeney of Harvey, Ill.; "Steam Shipping of the Great Lakes" by Walter Miller, superintending engineer, Globe Iron Works Company, Cleveland, Ohio; "Steamers of the Great Lakes compared as regards Strength" by J. R. Oldham. Unfortunately two of the papers, on the programme Friday were not in print, which prevented an extended discussion, and a third, that of Mr. Miller of Cleveland, had not been furnished by the New York printers in time for study by the engineers. Such of the papers as were in readiness, however, were taken up and were discussed in a brief way during the few morning hours before the final adjournment. Just previous to the close, the foreign visitors were accorded votes of thanks for their attendance, and they responded with liberal compliments to their friends in the United States. Commodore Melville and Passed Assistant Engineer McFarland were warmly congratulated on the success of the gathering and thanked for their efforts of a year or more in preparing for the congress. There can be no doubt that the public volume of the proceedings, including the papers and the discussions, will be one of the most valuable collections of information in regard to marine engineering and naval architecture which has ever appeared. Arrangements have been made with Messrs. John Wiley & Sons, of No. 53 East Tenth street, New York City, for publishing these proceedings in book form, and subscriptions may be sent to these gentlemen. It is the desire of Commodore Melville to have these proceedings circulated as widely as possible, so that anyone who wishes to purchase them can do so by addressing the Messrs. Wiley and remitting the price of subscription. The proceedings will comprise some 1,500 large octavo pages, including about 200 plates.

A general meeting of the divisions on Saturday, at which Vice-Chairman Chanute presided, closed the congress. Chairmen of the several divisions made reports upon the work accomplished, and then the engineers from abroad were called upon for remarks. They were astonished by the boldness of American engineers, who are solving most difficult problems. When representatives of all of the foreign nations had spoken the congress was declared closed. In the evening an informal reception was tendered the visiting engineers at No. 10 VanBuren street, the headquarters of the associated engineers of Chicago.

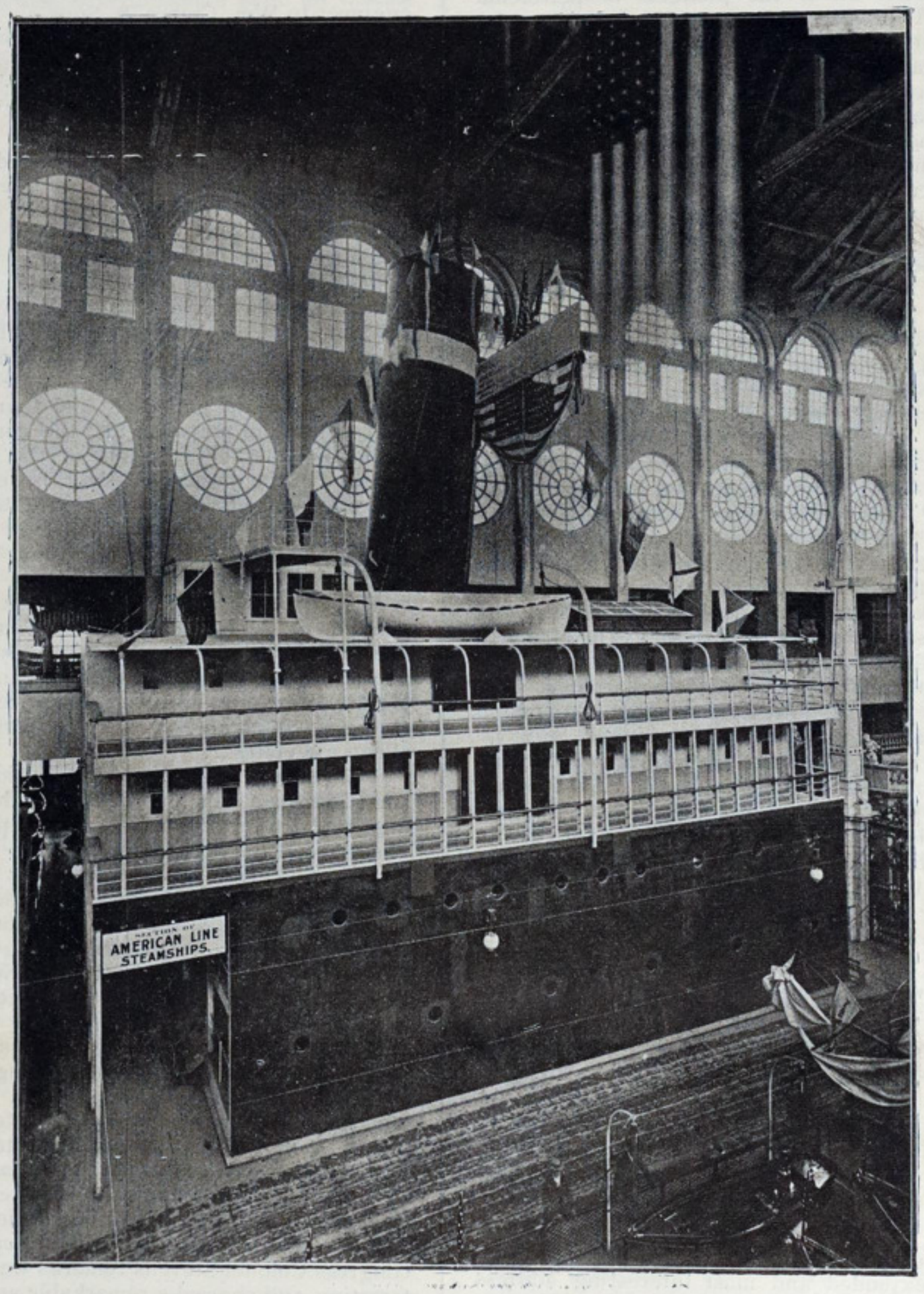
Col. E. A. Stevens of Hoboken, president of the New York and Hoboken Ferry Company, was among the most prominent young men at the Chicago meeting. He is a son of the late Edwin A. Stevens of Castle Point, N. J., who was one of the most prominent early promoters of steam navigation in America. Col. Stevens is a graduate of Princeton College of New Jersey, he having prefered a regular classical course in that institution to one of a more technical character in Stevens Institute of Technology, which was so liberally founded and endowed by the Stevens family. In the deliberations aud discussions of the congress Colonel Stevens remarks were invariably extremely interesting and showed a remarkable amount of empirical information relating to the uses of steam in navigation that might be instructive to the closest student of science.

With such young men around him as Passed Assistant Engineer McFarland, it is no wonder that Commodore Melville is credited with having accomplished a great deal more than any of his predecessors in the navy. Although giving every evidence of the greatest respect and loyalty to his chief, Mr. McFarland's manner of carrying out the duties of the office of secretary of the congress was such as to cause most favorable comment from nearly everybody in attendance. He is certainly regarded among the brightest young men in the navy and is destined for a position of more than ordinary importance. It is unfortunate, in view of his valuable service in Washington, that he is soon to go to sea.

WORLD'S COLUMBIAN EXPOSITION.

More of the leading foreign and home exhibits at the fair —The American line ships, Bethlehem Company's big hammer and other special features— Relics and curiosities.

In an enlarged edition of the REVIEW, date of June 29, a general description was given of the grand marine display in the transportation building, World's Columbian Exposition. Brief reference was made to nearly all of the exhibits in both foreign and American sections, and many of the most important features of the big collection were illustrated and described in detail. The list of exhibits deserving of special mention is very large, and more of them are now taken up in these pages devoted to the fair. Among the most striking objects, and those which at once arrest the attention of every spectator, are the section of the International Navigation Company's new ships and the great model of the Bethlehem Iron Company's steam hammer, of which illustrations have, fortunately, been secured for this issue. Both of these have been described at some length in previous numbers of the REVIEW, but the illustrations will serve to show their immense proportions, and now that all of the important features in the American line ships have been agreed upon, visitors to the fair from this time on may expect to learn even more about them than could be obtained from a walk through the section of cabins, state rooms, steerage quarters, etc. Representatives of the International company in charge announce that within a few days they will have on exhibition half models of hull and engravings of the ships complete from paintings prepared under the direction of the builders. According to the final plans the two new ships building by the Cramps of Philadelphia, and which are to be forerunners of

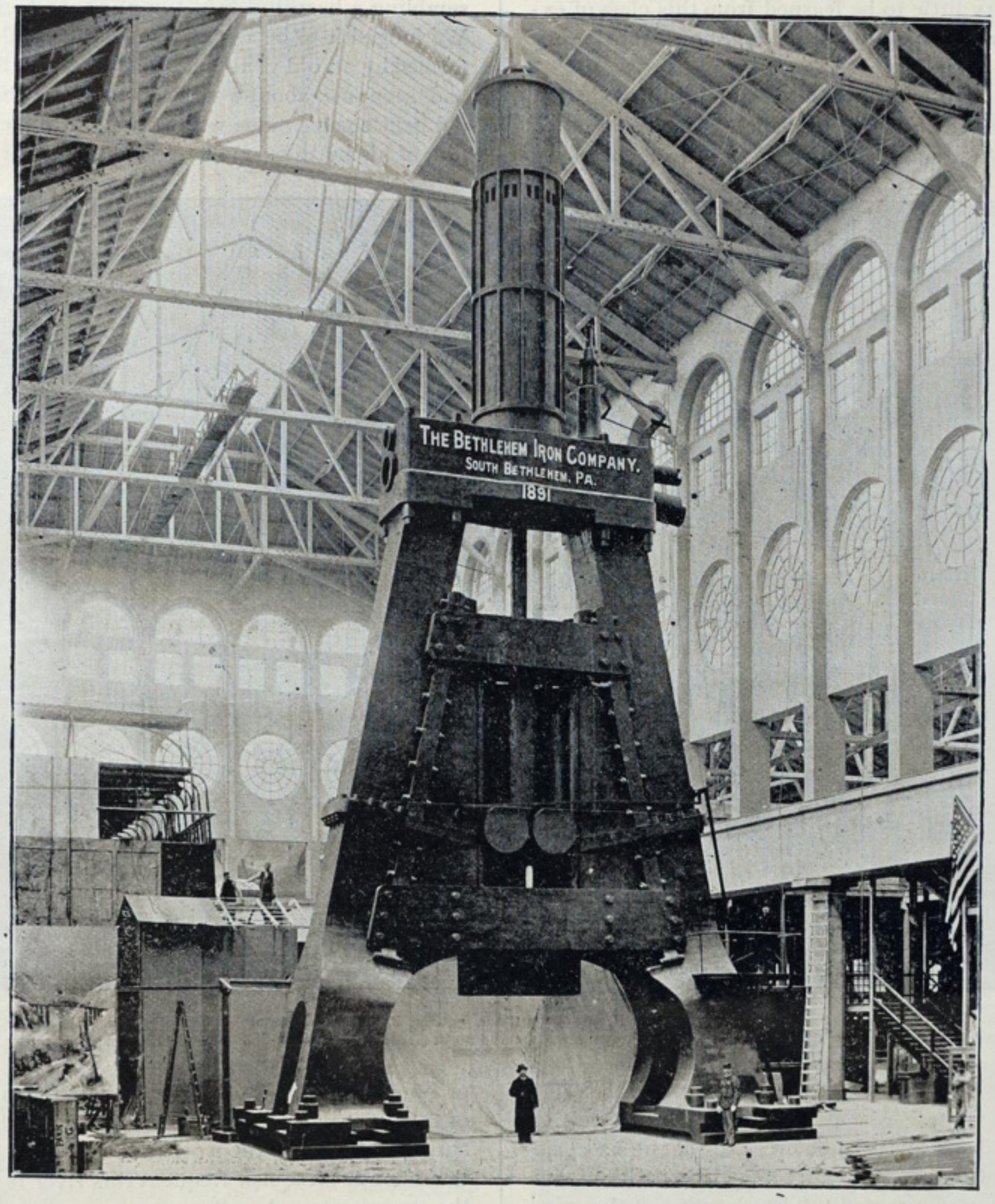


SECTION OF AMERICAN LINE STEAMSHIPS.

Atlantic liners of immense proportions, are to be somewhat smaller than the Paris and New York, but are expected to develop 21,000 horse power. The force of workmen at the Philadelphia ship yard will be increased shortly and the two new ships will be ready for service next summer.

The Bethlehem Company's big hammer, which forms another subject for illustration, and which was described in the REVIEW of June 29 last, occupies an appropriate position, as it rises amid the models of many merchant vessels and vessels of war, so numerous in the British section just to the north of the building. In this section, which includes the many magnificent

exhibits from such firms as William Denny & Bros., J. & G. Thompson, Laird Bros., Armstrong, Mitchell & Co., the Fairfield Ship Building and Engineering Company and many others, there are models of the greatest merchant and naval vessels in the world, some of which will receive special attention in future issues. One picture in William Denny & Bros. collection, that of the experimental tank, has been given special attention by naval men visiting the fair, and we have received, in addition to an engraving of the picture, a very complete description of this tank from the Dumbarton firm, which will be published in the next issue of the REVIEW. It is well known that the yard of Messrs. Denny is one of the most widely known and scientifically conducted yards on the Clyde, and a description from them of the famous experimental tank will undoubtedly prove interesting.



BETHLEHEM IRON WORKS' 125-TON STEAM HAMMER.

SUB-MARINE CABLE DISPLAY.

A picture of the famous Great Eastern in a storm, which appears in connection with this description of some of the features of the fair, is taken from a large engraving of the original, which has a prominent place in the interesting exhibit of the Commercial Cable Company, occupying a pavilion in the gallery of the electricity building. Sir James Anderson, who was commander of the Great Eastern at the time of laying the first Atlantic cable, and whose death recently caused an irreparable loss to sub-marine telegraphy, was a personal friend of Mr. Geo. G. Ward, the vice-president and general manager of the Commercial Cable Company, and the inscription under the picture was placed under the original for Mr. Ward by the late Sir James. The exhibit of this company is among the most interesting in the exposition. Sections of cables, specimens of fractured cables, a complete working outfit of instruments, and in fact all of the detail necessary to represent cable sending and receiving stations are to be seen in this pavilion, and the representatives of the company are attentive in giving out information. Less than fifty years have elapsed since the first Atlantic cable was projected, yet there are 143,000 miles of cables in successful operation throughout the world. Eleven cables connect America with Europe, while the eastern shore of the continent and the western shores of Europe and Africa are encircled in cable loops. A cable may be laid from San Francisco to China, but at present all messages to that far-away country cross under the Atlantic, the Mediterranean, the Red and the Arabian seas to Bombay, thence by land to Madras, and beneath the waves of Singapore, a distance of nearly 15,000 miles under the sea and 10,000 miles on land, A message from Chicago would follow this route and cost $2.02 a word, while the charge for messages to England, France or Germany is but 31 cents a word. The length of time required in cabling varies slightly according to the conditions, but a question has been sent from New York to London and instantly answered by the operator, all within the

short space of forty-five seconds. Again, there is a record of a message having been flashed 8000 miles in a second of time, the signal passing from the McGill University at Montreal to the Royal Observatory at Greenwich, and returning over the same circuit.

SOME RELICS OF EARLY AND PRIMITIVE NAVIGATION IN THE GREAT SHOW—CURIOUS AND INSTRUCTIVE EXHIBITS.

There are many curious boats to be seen in the transportation building, such as the Turkish caique, the gondola, the birch bark canoe, the long boats of the south sea islanders, the straw boats used in India, the sharpie and all kinds of imaginable sailing boats, as well as the seal-covered skiff of the Esquimaux. There is, however, very little to be learned from this class of exhibits, but there is another class of curiosities shown that is very interesting.

One of the most important of these is the original patent granted John Ericcson for his screw propeller. It was granted the 9th day of Sept. 1845, and is entitled an improvement in the screw propeller. After stating that he was a citizen, and the original and first inventor of the screw propeller, which had not, to the best of his knowledge, been used before, and that he had paid into the United States treasury $30, presented his petition and prayed for a patent, it was granted. The drawing of the original wheel, as well as the letter patent, is shown, and everybody interested in steam navigation should not fail to see the first idea of the screw propeller, which has made possible the great advancement that has taken place in marine engineering since that time. In the same exhibit, which was collected by Lieut. Baker, is another curiosity. It seems that when the flat-boatmen on the Mississippi river heard of the success of Fulton with his steamboat, they reasoned that the advent of such craft on the river would ruin their business, and they set about at once to create a sentiment against steam boats. One of their number, of a very imaginative turn of mind, concocted an odd circular, which was in the form of a letter, and which contained for a heading an engraving in colors of the most horrible marine monster that could be thought of. The circular reads as follows:

"A letter from a respectable gentleman, resident at the Natches, to Mr. Woodwell, merchant at Baltimore:

"I take this opportunity to inform you, as you ponder on miracles, of one of the greatest, perhaps, that you ever heard of. As we were coming down the Mississippi the 2d of this month, we heard a tremendous noise, followed by all kinds of fish, flying, as it were, through the water, and passing our boat. We upset and lost not only cargo and the boat, but with a great deal of exertion preserved our own lives. By the tremendous surge we were precipitated on shore. We found that many millions of fish had followed us, and judge of our horror when we observed, not more than a hundred yards from us, a monster resembling a beautiful fish, tumbling and roaring in the water. We judged it to be something of the whale kind, but were informed by an old gentleman that it was called a torpedo, that he had seen one about a week before, but that it was small. The old gentleman's name was Fulton. He mentioned that a relative of his by the same name had seen four of them on the coast of France and England; that he had ingeniously examined one of these fish, and found the bones of the back was formed with springs, similar to the works of gun-locks. It was his opinion that should these fish frequent this river it would greatly impede the steamboats. A volley of 10 or 12 large cannon fired instantaneously off was, comparatively speaking, only like sneezing to its terrible noise. Fire streamed from all parts of its back, accompanied with large clouds of smoke; the trees shook and some fell. In about three-quarters of an hour we discovered the monster had got on shore, tossing and tearing everything to pieces with its tusks and claws. We measured this monster of a fish and found it to be 87 feet 6 in. from the end of its tail to the snout.

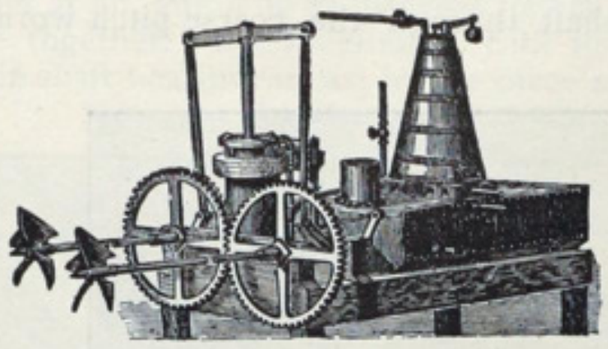
ELIAS R. COFFIN.

"N. B.—I had like to have forgot to tell you that upon the examination of the entrails of the fish we found to our astonishment an uncommon large American Barlow pen-knife that cuts on both sides of the blade."

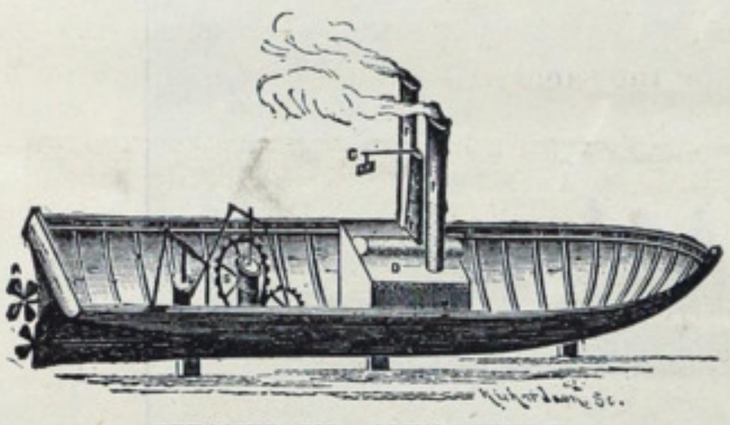
In the Hoboken Ferry Company's exhibit is another curiosity that will attract more attention than the adjoining model of

"The GREAT EASTERN, having grappled the lost cable of 1865 three times, getting it from the bottom ¾ of a mile, ¾ and ½ a mile, in the several attempts, finds her tackling exhausted, steers homeward, a gale springing up, and night coming on—August 12th, 1865."—JAMES ANDERSON.

one of their finest ferry steamers, the Hamburg, with a section of plate taken out of the hull, which enables one to see the models of the boilers and engines that operate the boat. It is the original engine and boiler of the Col. John Stevens, built in Hoboken, N. J., in 1804. The engine is high pressure, non-condensing, with a cylinder 4½ by 9 inches stroke. The tubular boiler contains 28 copper tubes of 1½ inches diameter. These



ENGINES OF THE COL. JOHN SEVENS, BUILT IN 1804.



STEAMER COL. JOHN STEVENS.

are set in a boat that was built as nearly like the original boat as possible. The original boat was navigated in New York harbor in 1804, with an average speed of 4 miles an hour, and for a short distance 7 to 8 miles an hour. The hull was 30 feet long.

On the opposite side of the gallery is a model of the Novelty, which represents a later accomplishment in navigation in England. This was the first screw steamer to carry a cargo in the United Kingdom. It was built in 1839 by H. Wimhurst, London. It was 117 feet long, 24 feet beam and 14½ feet deep. In 1841 the Novelty made voyages from Liverpool to Constantinople with cargo, returning to London. The first engine was high pressure with a 14-inch cylinder, and the power was given at 60 pounds. The mizzen mast was 15½ inches diameter, and it was made hollow, so that it could be used for a smokestack. Later the engines were changed to rotary engines.

The Essex Institute, Salem, Mass., presents a collection that illustrates some of the first brigs and frigates built on the New England coast. The dimensions of the "Essex, frigate, viz. 150 feet keel, 37 feet beam, 27 feet dead rising, 850 tons," with four yards on the main and mizzen mast and five on the fore mast, and a cross jack yard, which since has been corrupted into crojeck yard, appears in the hand writing of Enos Briggs, the builder. The frigate was built in 1799.

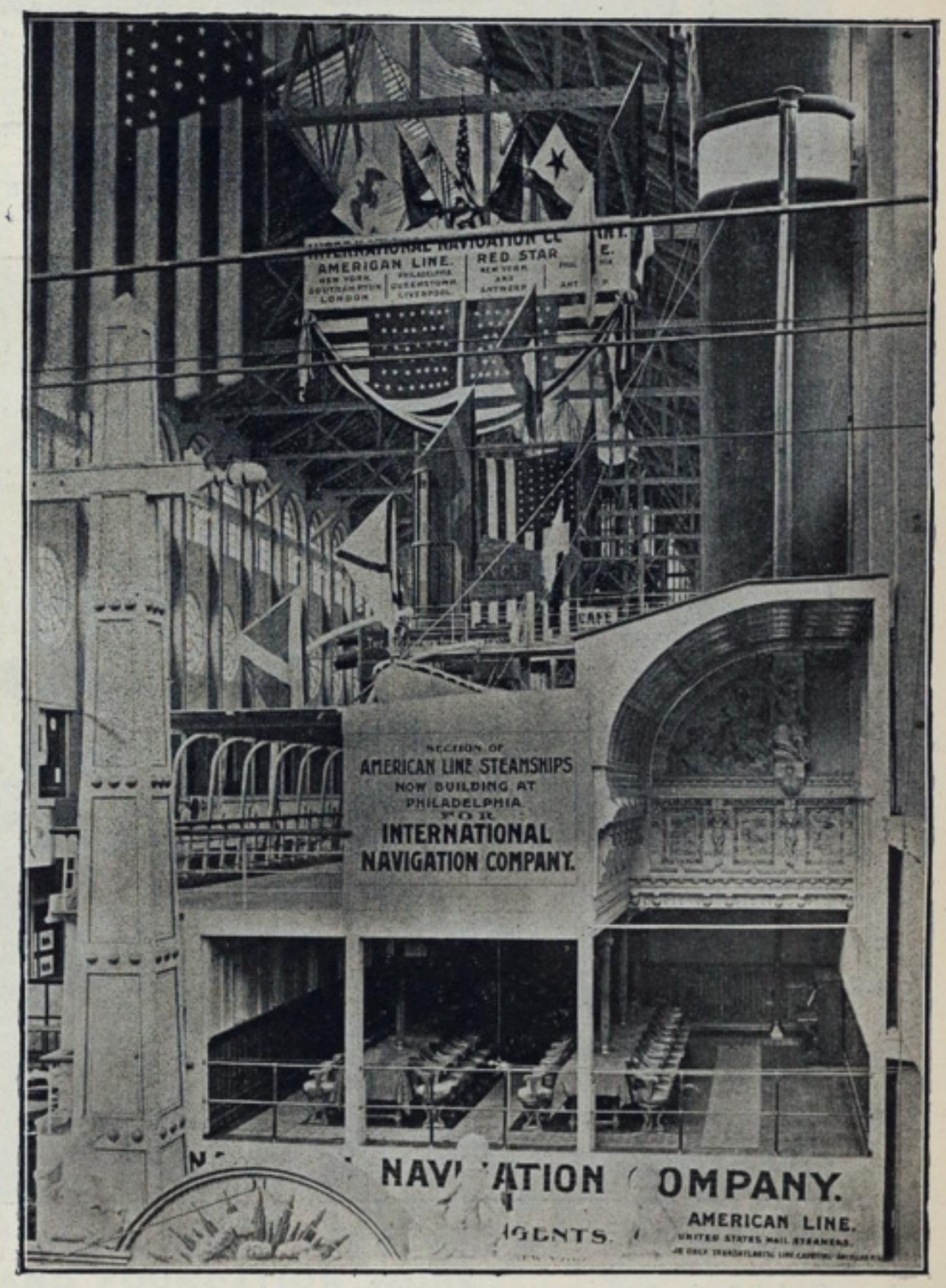
Down near the "golden door" entrance is an exhibit that will attract attention from those who admire heroism. It is the original boat used by Grace Darling and her father in rescuing nine sailors from the wreck of the Forfarshire, Sept. 17, 1838. The boat is a ponderous affair, and it seems almost impossible that a girl of twenty-two years and one man should have been able to handle it in a storm.

Standing all alone near the Fairfield exhibit in a neat model case, is a model of a whaleback yacht built for the czar of Russia by John Elder & Co., no doubt after the czar's own plan, for no naval architect would acknowledge it for money. It is almost round and the decks are rounding just like the whaleback, but instead of turrets the cabins are built up solid. She has three stacks, three screws and three decks. She was a failure and has been abandoned. If anything in the shape of a boat might be called with cause a tub the Livadia—such was her name—is that boat.

Several inventors have exhibits in the transportation department that will vary the monotony to those who get tired of studying the time-tried principles of navigation in the other exhibits. One is presented by a Yankton, S. D., man. It is a boat, the hull of which consists of two cylinders that have spiral blades extending out several inches. By machinery in the cabins, the cylinders are rotated and the boat goes at a fabulous speed. Another form of the same patent is to have the cylinders located in the bow of an ordinary boat. The rotation of cylinders would draw the water in at the bow and discharge it at the quarter.

EXHIBIT OF THE BATH IRON WORKS BATH, ME.

The collection of capstans and windlasses, hoisting and steering machinery and pumps exhibited by the Bath Iron Works of Bath, Me., has attracted unusual attention among the many fine displays in the transportation building. Engineering of London thought this exhibit of sufficient importance to devote more than a page, in a recent number, to drawings and reading matter descriptive of the Hyde steam capstans and windlasses which it contains, and from this description some extracts are made here. The general construction of all of the machines will be understood by describing one, a steam capstan windlass, in the arrangement of which the windlass is on the main deck and the capstan on the upper deck. The windlass and engines are complete on one bedplate, making the entire machine self-contained. The windlass is driven by a pair of engines, comprising double cylinders of the piston-valve type, set at right angles to

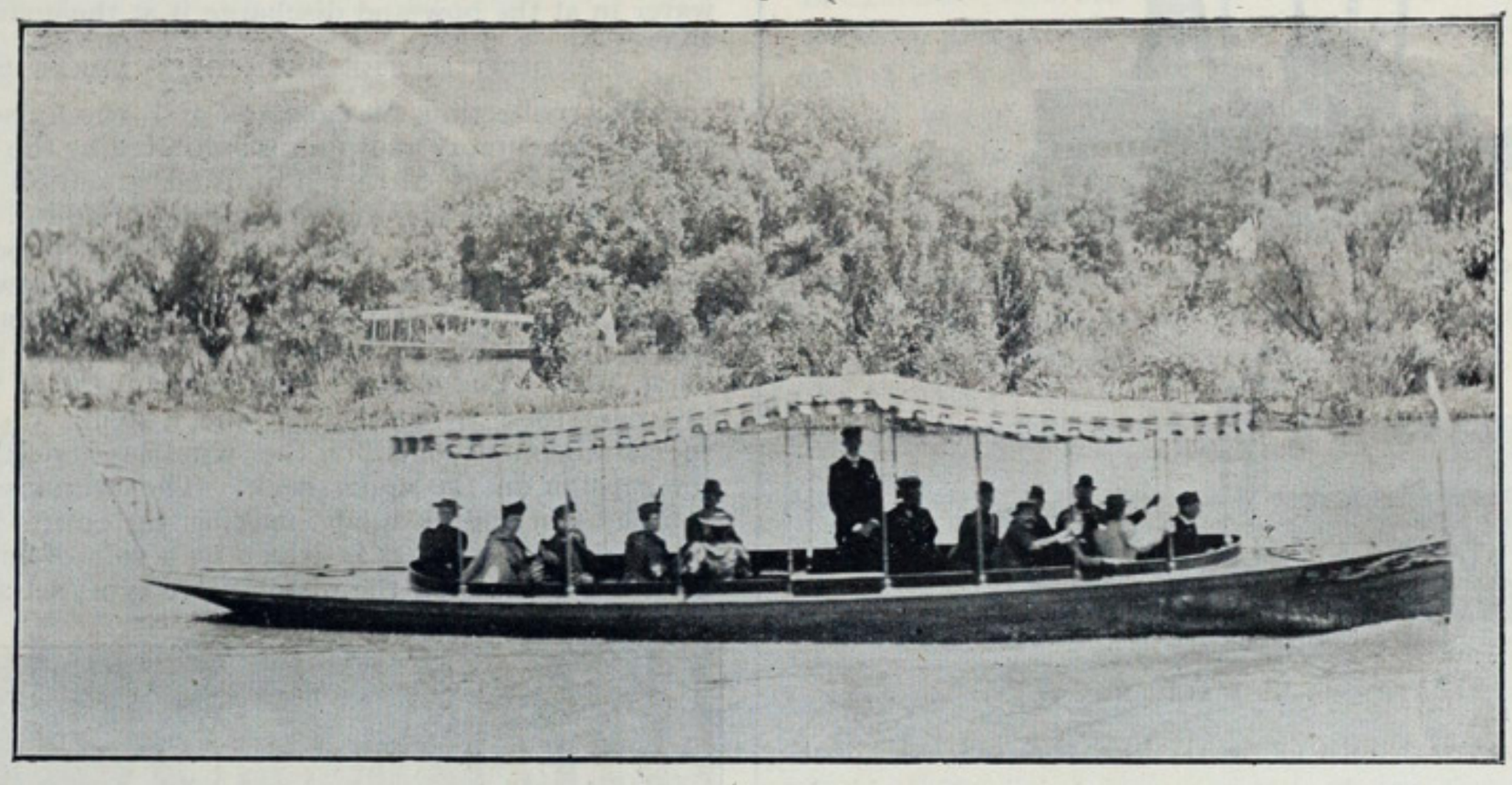


END VIEW OF AMERICAN LINE SHIP'S SECTION.

each other, and making angles of 45 degrees with the bedplate. Both act on a single crankshaft, on which are fitted the worms which drive, by means of worm gears, the horizontal windlass and upright capstan shafts. The worm driving the wheel on the windlass shaft has a left-hand thread, and the one driving the capstan shaft a right-hand thread, so that the thrust from both worms comes on opposite sides of a thrust bearing, which forms at the same time a journal for the forward end of the engine shaft, and is part of the same casting that forms the center

bearing of the windlass shaft. Between the ends of the worms and the thrust bearing are placed alternately cast iron and composition thrust rings, which, with the ends of the worms, run in a bath of oil, the oil-boxes being part of the same casting as the thrust bearing. The worm gears are each composed of two pieces—a center, which is keyed solidly to the shaft on which it is located, and a loose toothed rim engaging the worm, this rim being also fitted on its inner surface with rachets which drive the centers by means of pawls held in position by springs. These pawls may be thrown out of contact with the rachets on the rim so that the windlass is always ready for use, either by hand or steam power, without changing any of the parts.

In addition to the regular purchase (which is sufficient to raise both anchors at the same time under ordinary circumstances) the additional worm wheel on the windlass shaft (through which power is applied by hand) affords means for obtaining a double purchase for use in an emergency. This is done by throwing out the pawls in the main driving gear, and applying the power from the engine first to the upright or capstan shaft, and then to the windlass shaft through the coarse pitch worm and wheel



ELECTRIC LAUNCH—BUILT BY THE DETROIT BOAT WORKS.

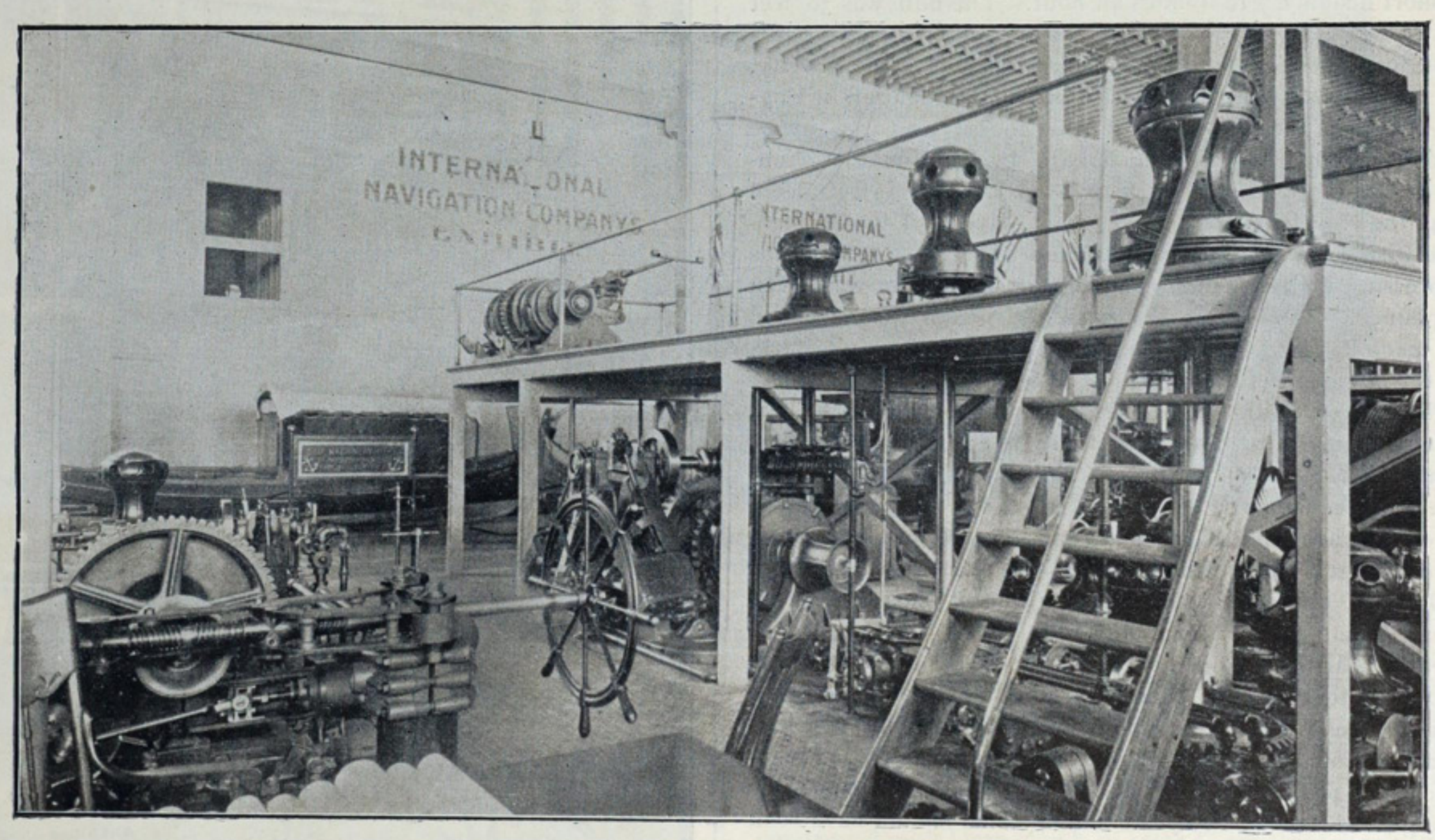


EXHIBIT OF SHIP MACHINERY DEPARTMENT—BATH IRON WORKS, BATH, ME.

when it is desired to reverse the windlass or use the double purchase.

The windlass may be driven by hand from the deck above by a capstan, which is connected with the windlass by means of a coarse pitched quadruple-threaded worm on the upright capstan shaft, engaging with a worm gear on the windlass shaft. This worm gear is of the same kind as the main driving gears of the windlass and capstan, the center being keyed firmly to the windlass shaft, and driven from the loose rim by means of rachets and pawls, as in other cases. This arrangement does away with the necessity of disengaging gear for either steam or hand power, through which the hand power is applied. The wild-cats, over which the cables run, are locked and unlocked by a positive screw locking device, which is so designed that the wild-cats may be easily unlocked, even with a heavy strain on the cables, The wild-cats are controlled when paying out chain by friction bands arranged with powerful brakes, the whole being of sufficient strength to "ride" by, so that when riding at anchor more cable may be paid out at a moment's notice simply by slacking the brake.

The capstan connected with the windlass is driven direct from the engine shaft by worm gearing in the manner commonly

applied to independent steam capstans. It may also be used as a hand capstan, the capstan-head, when turned by the bars in one direction, giving quick speed, and in the opposite, a slowed speed in the ratio of 1 to 3. The gears for the slower speed with hand power are placed in the base and lower part of the barrel, where there is room to make them of ample strength.

The engine is located aft of the windlass shaft. Very little space is required, as the cylinders, being placed at right angles to each other and at an angle of 45 degrees to the bedplate, are brought close together. Each cylinder, with its steam chest, slides and main shaft bearing, is cast in one piece and is fastened to an **A** frame which connects it to the bedplate. The cylinders and steam chest are lagged with cast iron, and the spaces between the casting and the lagging are filled with asbestos or mineral wool. The valve gear of both cylinders is driven from a single eccentric on the main shaft, placed aft of the aftermost bearing of the engine proper. Just forward of the engine on the main shaft is keyed a heavy balance wheel, which insures the smooth running of the engine. A reversing valve is placed on the bedplate between the feet of the **A**-frame, within reach of both levers which control the friction bands of the wild-cats. This reverse is connected separately with the steam and exhaust openings of each cylinder, the main steam and exhaust pipes coming up through the deck and bedplate into openings in the bottom of the reverse valve. The valve, which is of the balanced piston type, is easily moved by the lever when reversing the engine. The parts are so arranged that by placing the lever in the central position, the engine may be stopped instantly.

DE GRAUW, AYMAR & CO.'S EXHIBIT.

The exhibit of De Grauw, Aymar & Co., Nos. 34 and 35 South st., New York, shown in the illustration, consists of a stand of oars from their factories at Toledo and Montpelier, O. This does not by any means represent the firm's entire business, which is that of ship chandlery, including an extensive trade in wire rope, cordage, oakum and marine hardware, besides the manufacture of flags. The colors presented by the New York Advertiser to the U. S. S. New York were made by this company. An indexed catalogue of ship chandlery was published by the firm recently and no ship chandler should be without it. Write them, stating that you are a dealer and mentioning the REVIEW, and you will probably receive a copy.

The illustration of the Bethlehem hammer in this issue is presented through the courtesy of the Iron Trade Review, Cleveland.

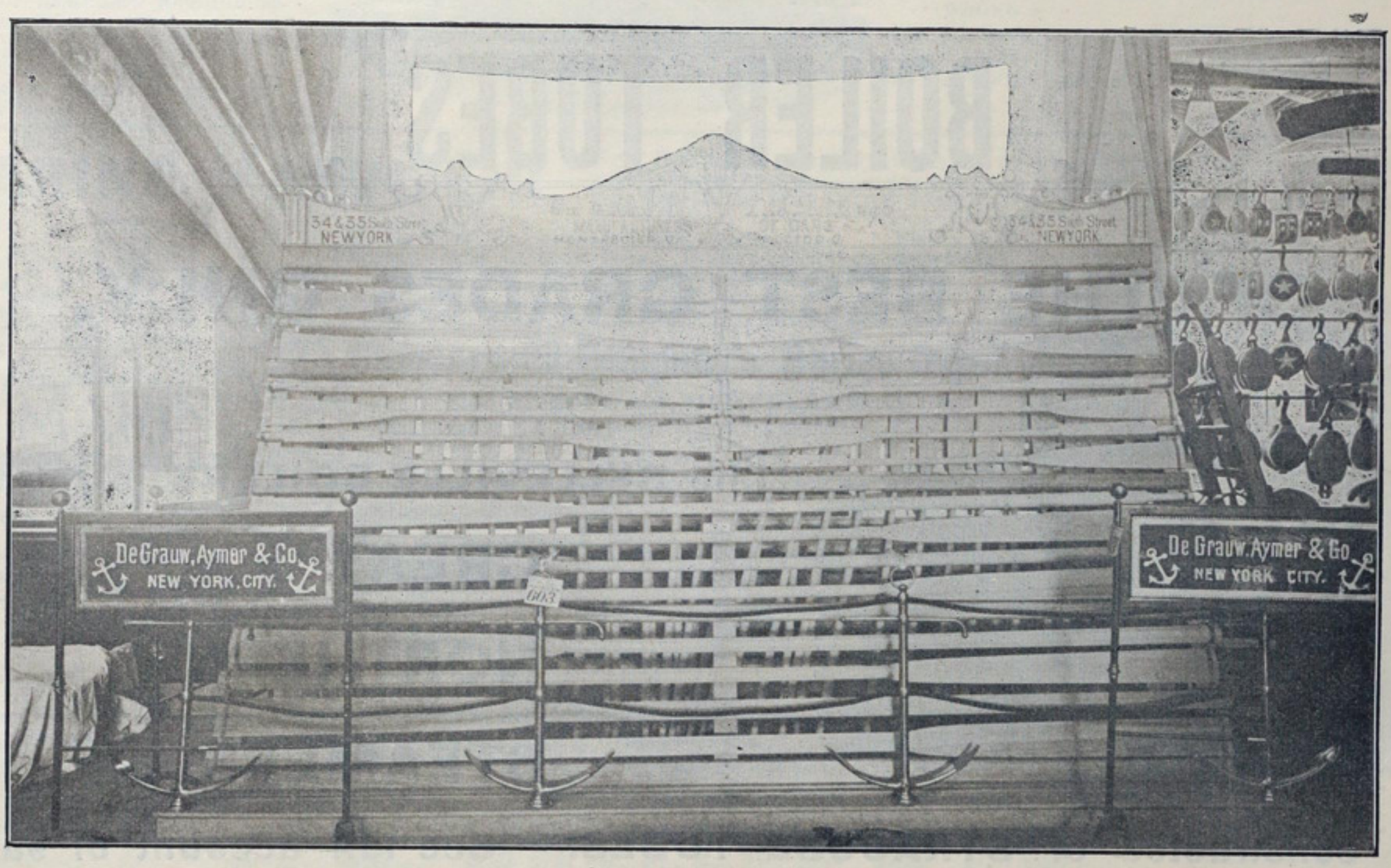
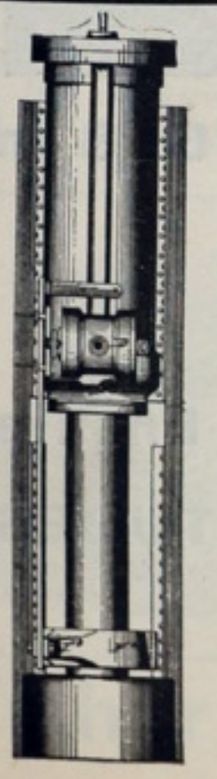


EXHIBIT OF DEGRAUW, AYMAR & CO., 34 AND 35 SOUTH ST., NEW YORK, N. Y.

British charts of Lake Superior cover the entire north shore. $1.



A. J. DUPUIS,

16 ATWATER STREET W., - - - DETROIT, MICH.

CONTRACTOR FOR

DOCK BUILDING, BRIDGE and TRESTLE WORK,

PILE DRIVING AND FOUNDATION WORK.

DRY DOCK BUILDING; builder of Detroit Dry Dock Co.'s New Dry Dock.

PATENTEE AND MANUFACTURER OF

DUPUIS STEAM PILE DRIVER HAMMER,

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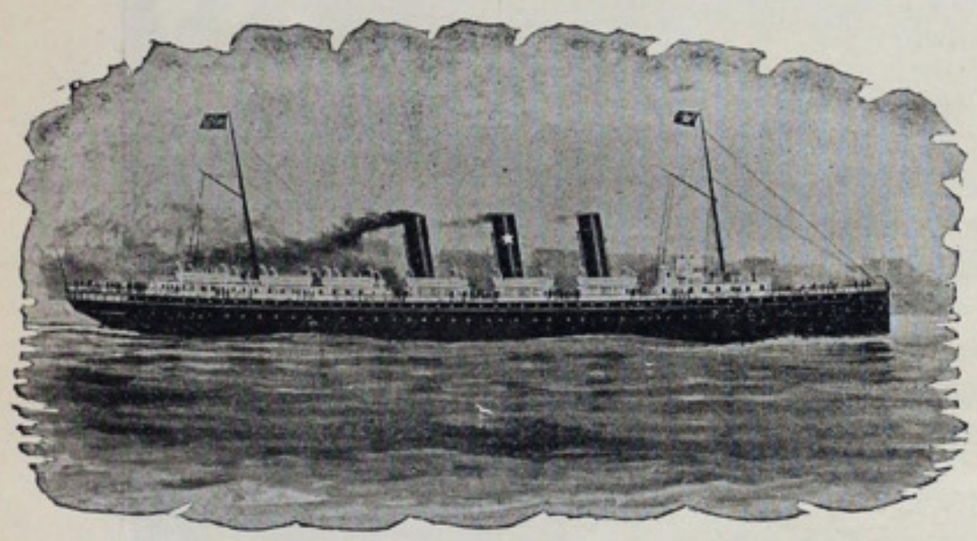

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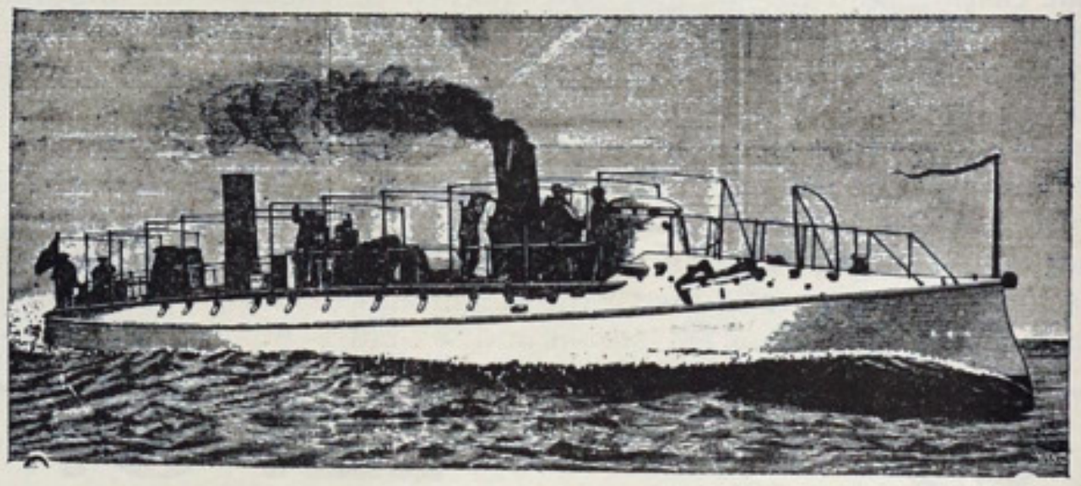

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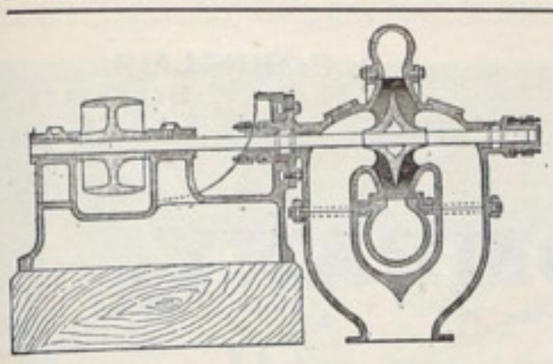

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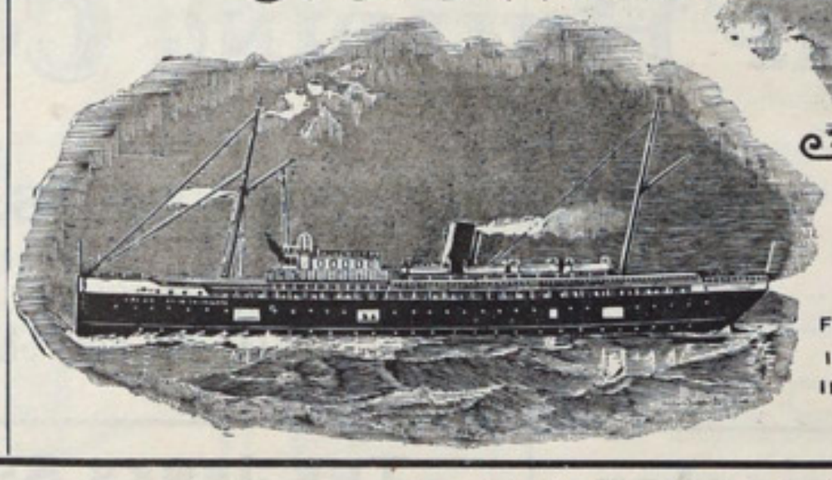

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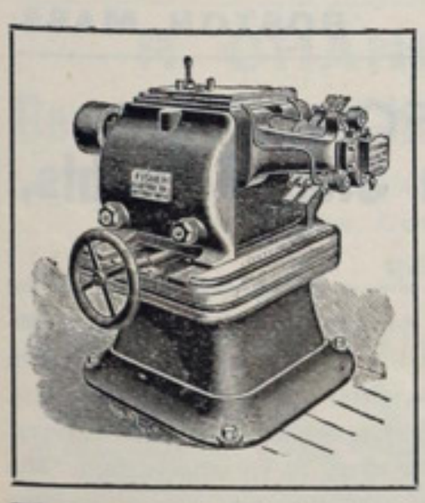

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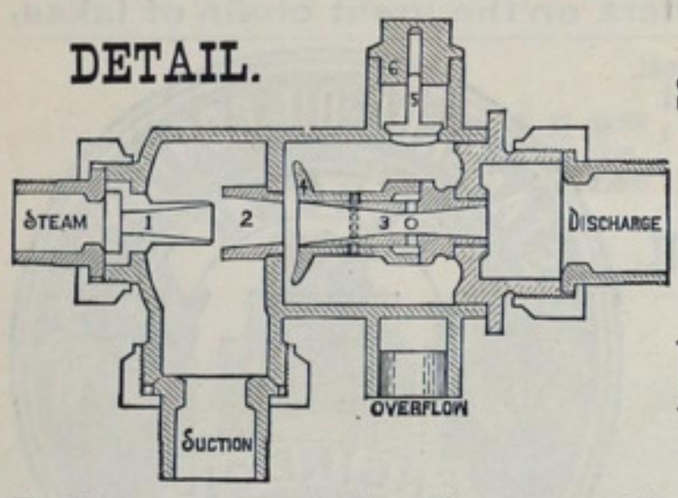

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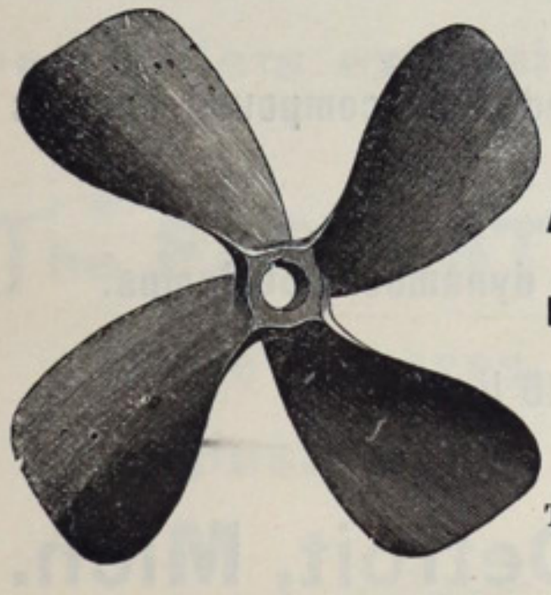

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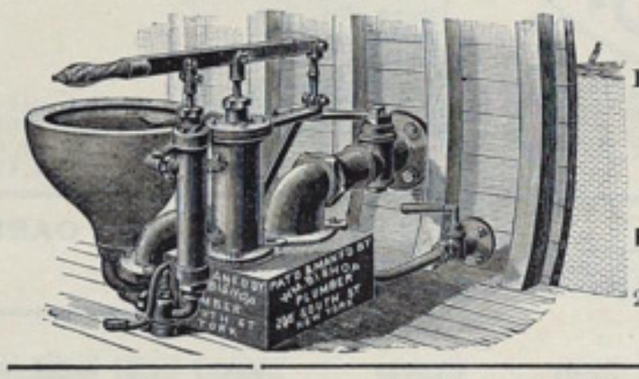

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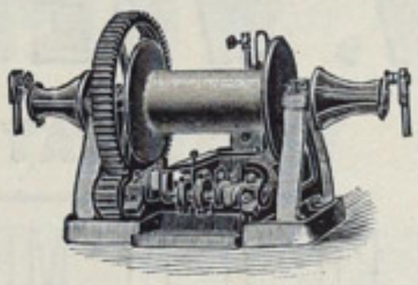

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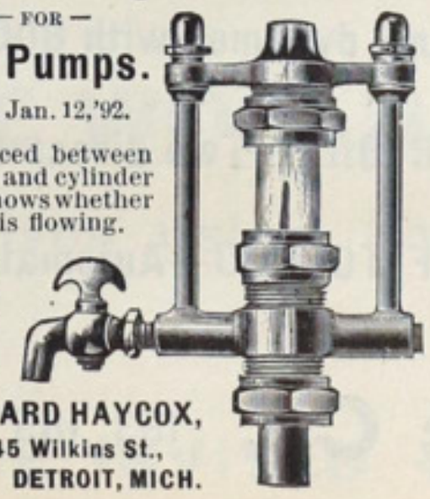

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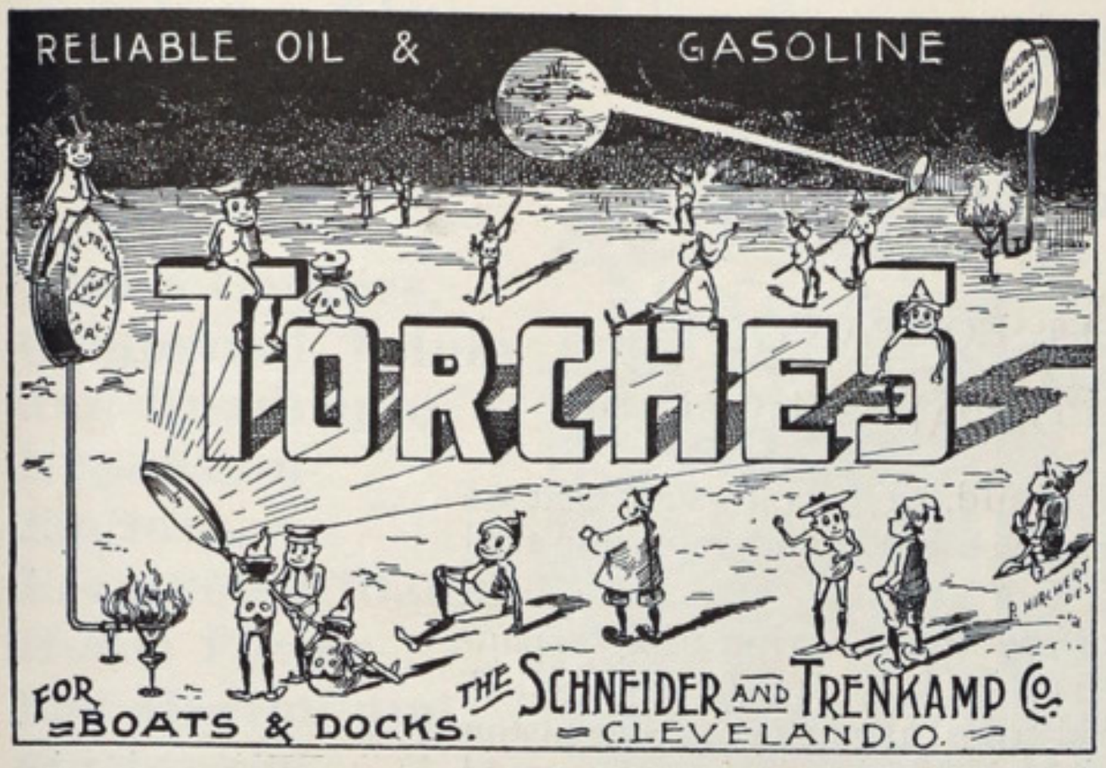

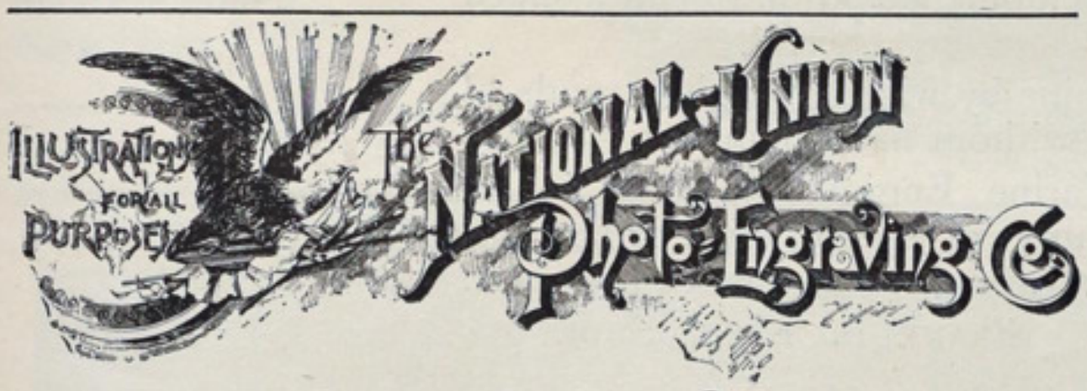

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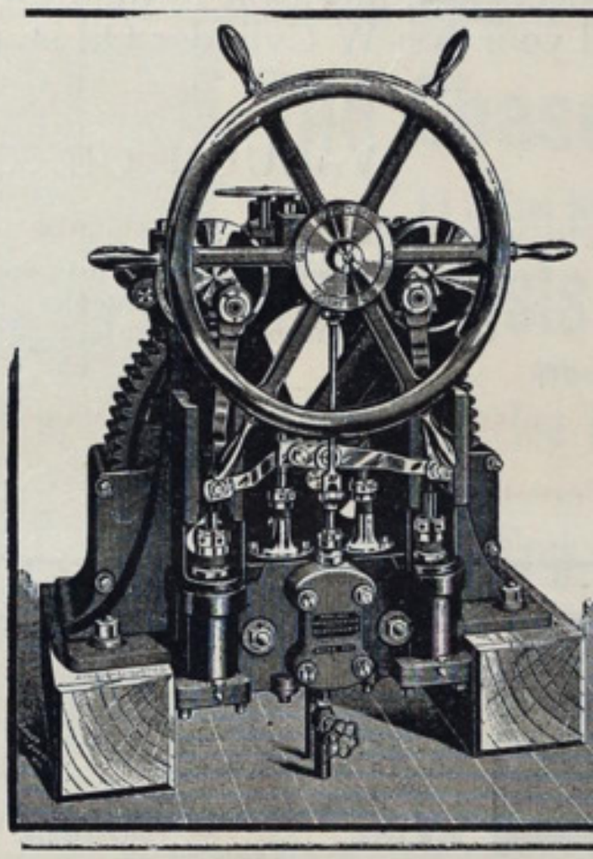

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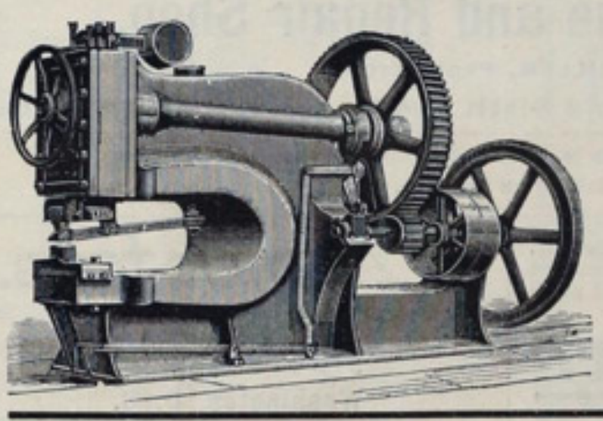

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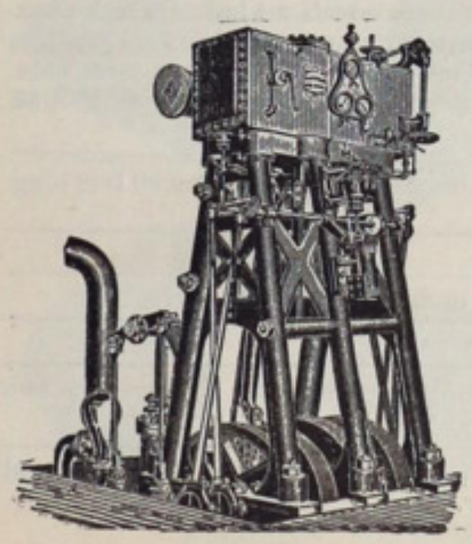

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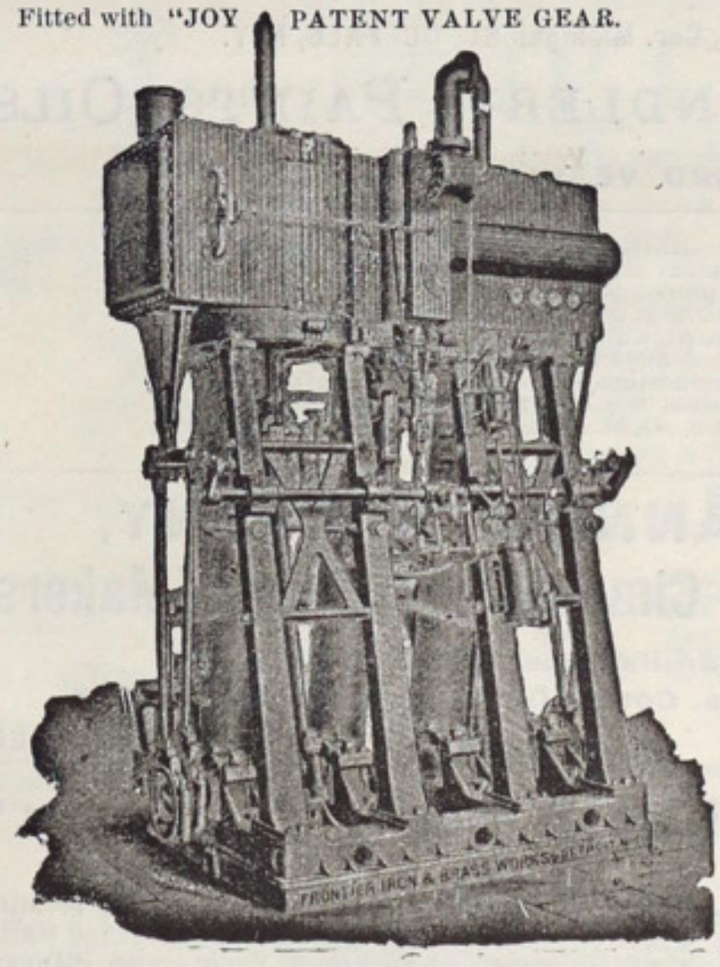

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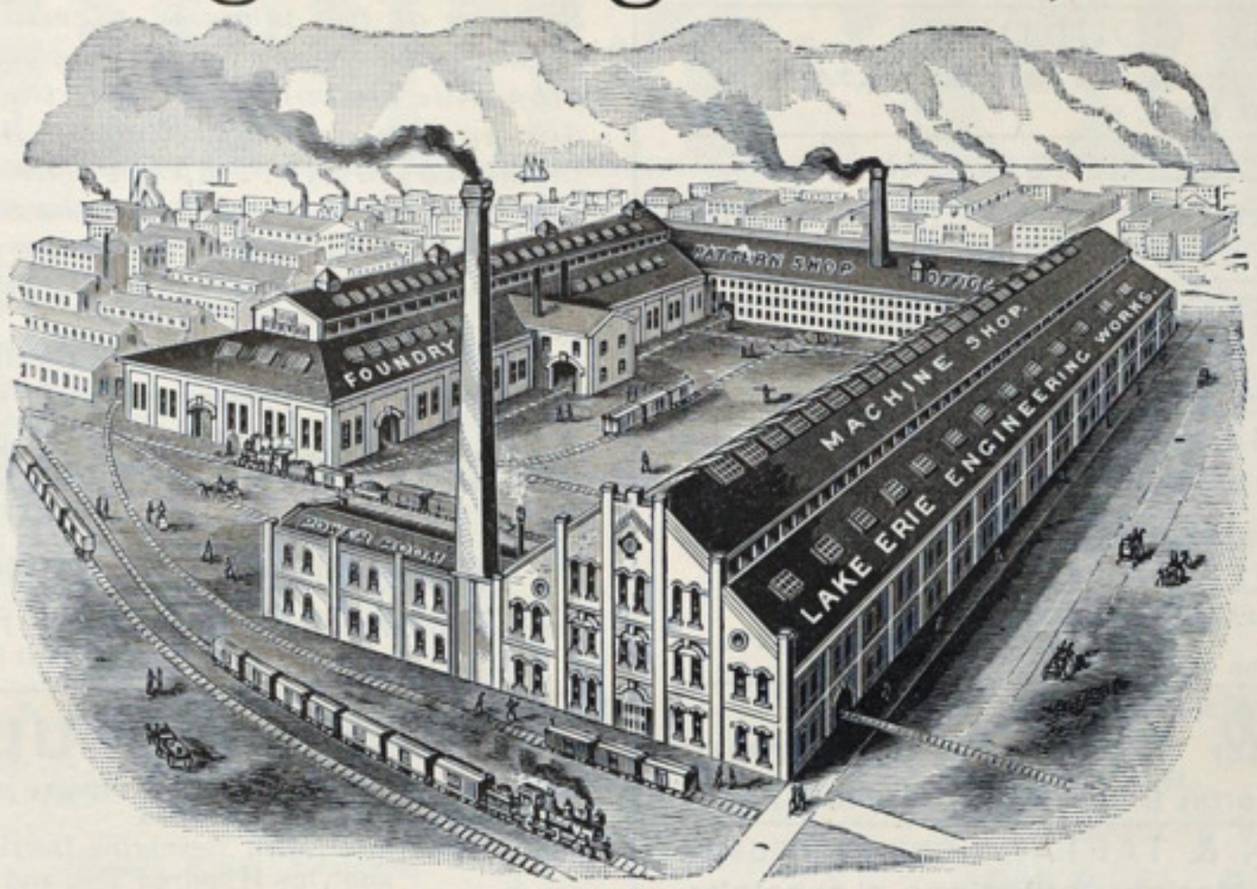

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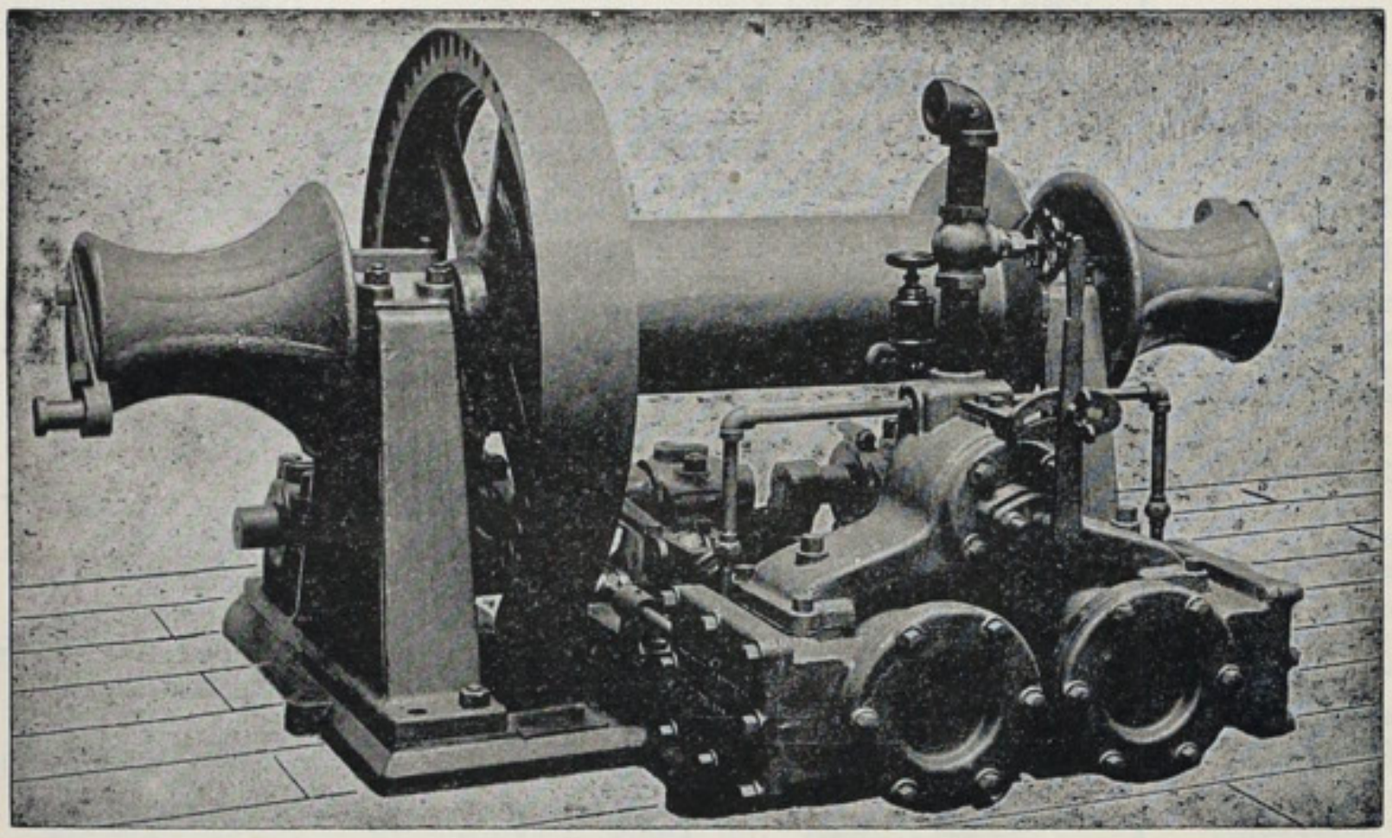

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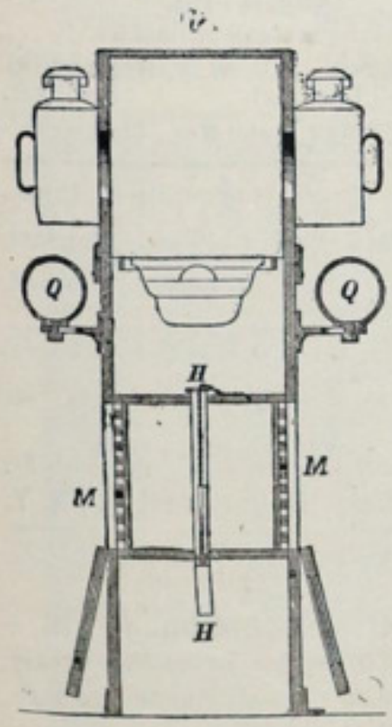

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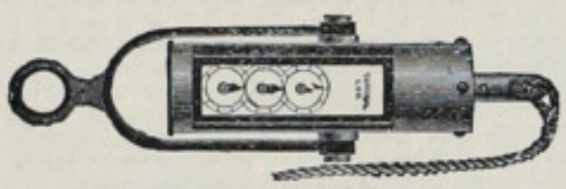

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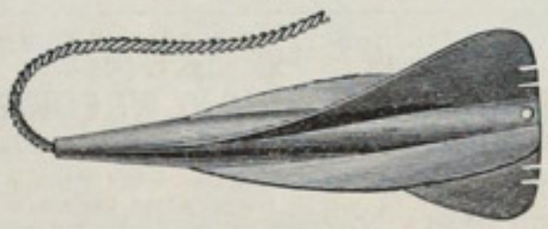

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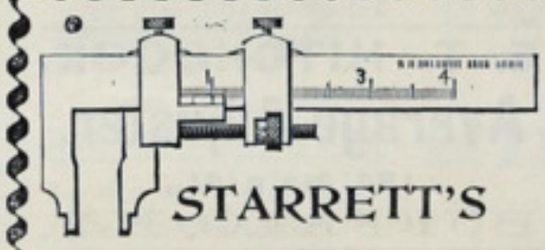

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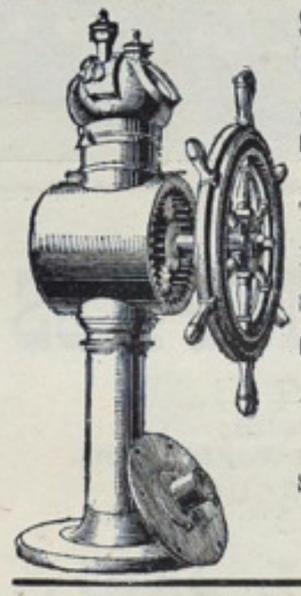

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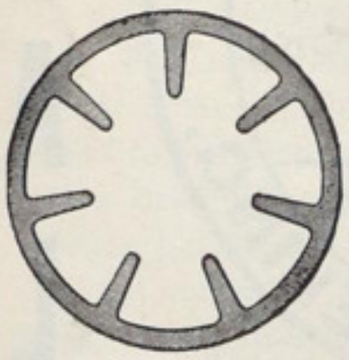

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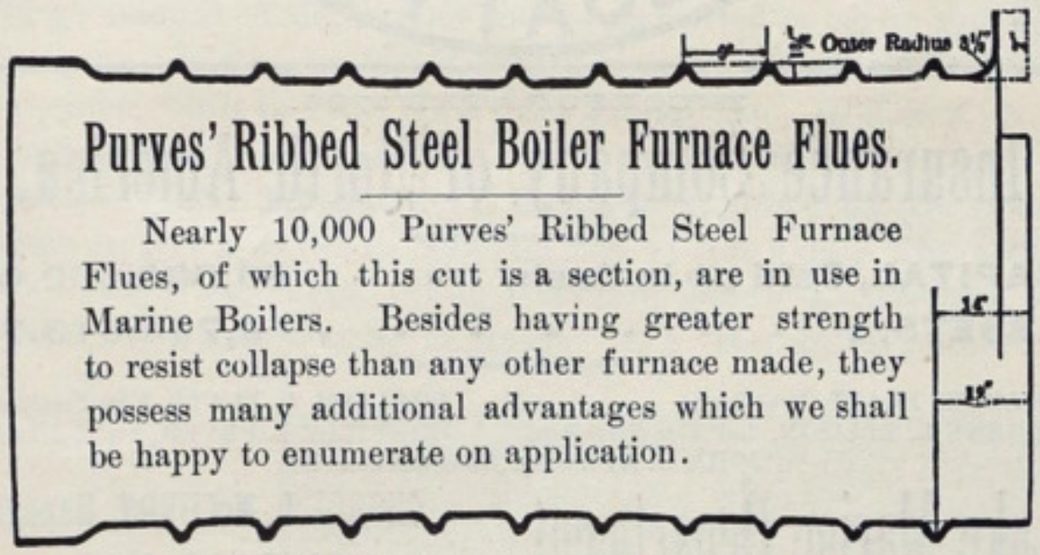

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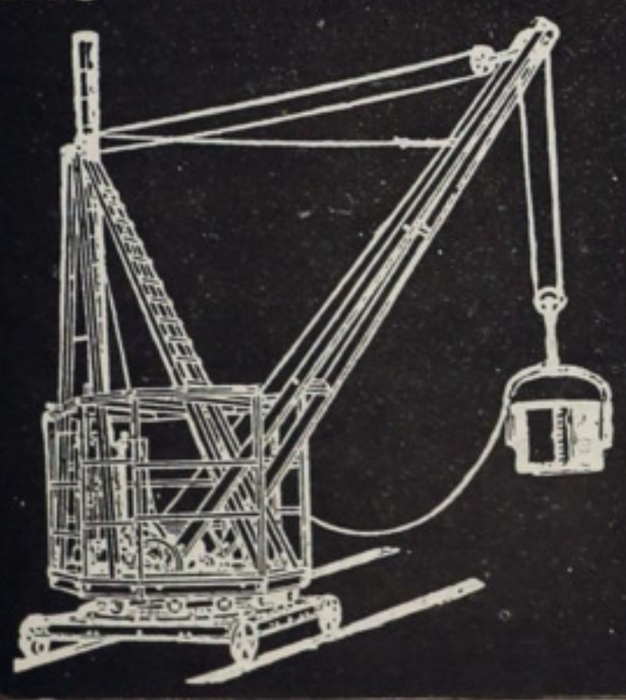

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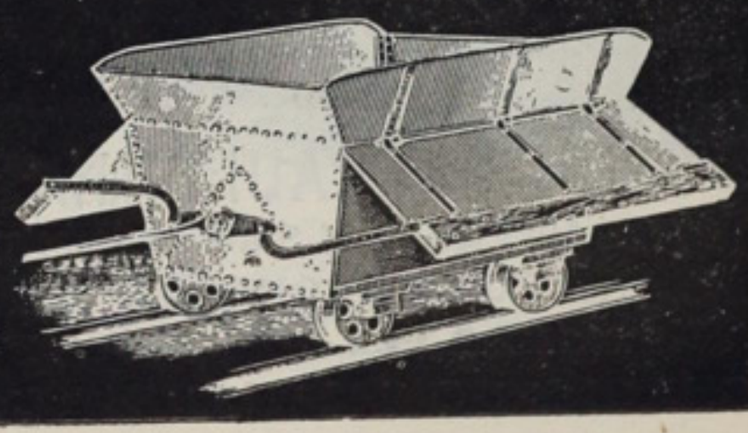

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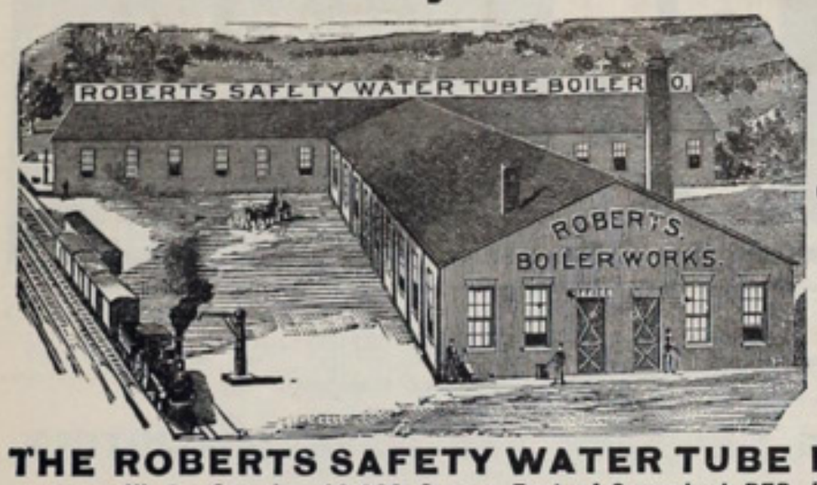

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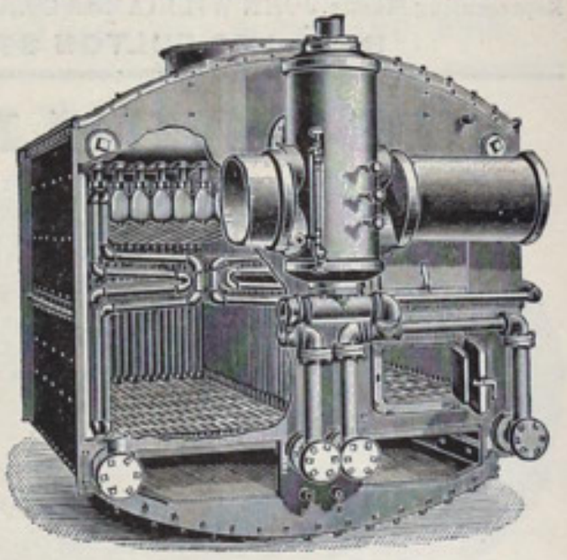

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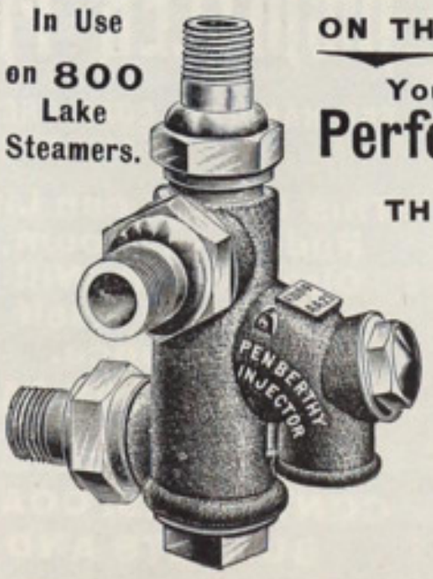

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